ASTHMA PREVALENCE DISPARITIES AMONG NATIVE HAWAIIAN/OTHER PACIFIC ISLANDER, ASIAN, AND WHITE ADULTS IN THE UNITED STATES – SOCIAL EPIDEMIOLOGIC FINDINGS FROM THE BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2001–2010

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“Hoʻomau” (Partial translation: The value of perseverance; to persist, to continue, to perpetuate; never give up).

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ABSTRACT

Objectives: Despite relatively high asthma prevalence, little is known about the epidemiology of asthma among Native Hawaiian/Other Pacific Islanders (NHOPI), or the roles of socioeconomic factors in asthma disparities among NHOPI.

Methods: Multivariable logistic regression using 2001-2010 Behavioral Risk Factor Surveillance System data was conducted to provide adjusted lifetime and current asthma prevalence estimates and ratios, within groupings by sex and self-identified census categories of race for the overall US population, as well as separately for the US state of Hawai'i. Asthma prevalence disparities by race were also investigated within groupings by sex and indicators of socioeconomic status (SES). The comparative abilities of risk factors to predict asthma within strata by race or SES were investigated using dominance analysis.

Results: Asthma prevalence markedly differed between groupings by sex and race, with those self-identifying as NHOPI frequently having the highest point estimates of ever-diagnoses and current asthma. There was evidence of excess asthma in Hawai'i compared to other US regions, especially among White women and Asians. Sociodemographic factors predictive of adult asthma prevalence varied by both sex and race. Women often had higher asthma prevalence than males of the same race, but the degree to which sex modified asthma prevalence differed by race, sociodemographic characteristic, and/or socioeconomic status. There were consistent dose-response declines in asthma prevalence with increasing SES only among Whites and women of race other than NHOPI, White, or Asian. Asthma was most frequent among NHOPI within some lower and upper levels of SES. Asthma disparities by race were modified by sex and SES; stratification by SES attenuated associations between asthma and race. However, some asthma disparities by race persisted after controlling for SES, including for NHOPI and in comparison with Asians. The dominant factors predictive of adult asthma prevalence depended on sex and race, as well as education attainment.

Conclusions: The distribution of asthma in the US is not socially equitable and instead depends on race and/or SES. The findings of this work call for greater considerations in asthma studies regarding interactions between race and social factors and provide a baseline with which to plan and compare other prevention programs, epidemiological investigations, and surveillance for asthma.

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LIST OF ABBREVIATIONS

aPR	Adjusted Prevalence Ratio
BMI	Body Mass Index
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
K	1,000
NA	Not available
NHOPI	Native Hawaiian/Other Pacific Islander
P%	Prevalence
PR	Prevalence Ratio
PIR	Poverty Income Ratio
SES	Socioeconomic status
US	United States

PREFACE

Asthma is an incurable chronic inflammatory disease of the respiratory system characterized by difficulty breathing, with episodes that can vary in severity. Episodes of wheezing from this disorder of the airways can become acute and life-threatening. Asthma can also substantially diminish quality of life, although symptoms can often be mitigated by patient education, pharmacotherapy, and/or avoidance of triggers (1-4). As a condition of complex etiology, asthma has many causative factors that interact. However, many risk factors for asthma are preventable such as obesity, smoking, viral infections, poor air quality (both indoor and outdoor), stress, and occupational exposures (1, 5-10).

There is no 'gold standard' for the diagnosis of asthma and so asthma surveillance and population-level epidemiologic studies typically rely on self-report. Estimates of asthma prevalence have gradually increased over the past half century in developed countries (11), becoming a very common disease in the US with 14% of adults reporting an asthma diagnosis in 2016 (12). Asthma is also common among US children and more so among boys (9.2%) than girls (7.4%), with prevalence that increased between 2001-2010 (8, 13). Indeed, asthma is considered an epidemic in the US, but prevalence varies geographically at both broad regional and local community scales (5, 8, 12). Although childhood asthma often persists into adulthood (14), asthma associations with sex reverse with age such that asthma is more common among adult women than men (8, 15-17). Unusual for a chronic disease, adult current asthma prevalence is inversely associated with age such that lowest prevalence is observed among those 65 years or older (8, 18). In addition, asthma is much more prevalent among adults who are of young age (18-34 years), obese, smokers, and/or who have lower levels of socioeconomic status (SES) as indicated by less education, lower income, or unemployment (5-8, 12, 13, 18-27). Asthma prevalence can also be associated with aspects of healthcare, particularly when surveillance is via the self-report of a diagnosis from a medical provider.

The burden of the asthma epidemic also varies by race/ethnicity. Lowest asthma prevalence in the US is usually found among Asians and Mexican Americans, while non-Hispanic Blacks and Hispanics of Puerto Rican descent often report asthma more frequently than Whites (8, 12, 13, 18, 25, 28-30). However, geographic and/or sociodemographic predictors of asthma can depend on race (26, 31-46), while racial asthma disparities are in turn often conditional on SES (19, 24, 46-49). Reducing asthma has long been a US national priority, including as an objective of the US Healthy People framework (50, 51). However, the asthma

epidemic and its associated social/racial disparities have continued unabated or worsened (5, 8, 12, 20, 30, 52).

Asthma is especially common among indigenous peoples (8, 29), including Native Hawaiian/Other Pacific Islanders (NHOPI) (26, 53, 54). NHOPI are a small (1.4 million in the US in 2016) but growing population of those identifying their race as including ancestry in the indigenous peoples of Hawai'i or other Pacific islands (39, 55, 56). Many potentially preventable diseases and sequelae are disproportionately prevalent among NHOPI including some cancers, cardiovascular disease, diabetes, mortality across the lifespan, and overall fair/poor health (26, 34, 36, 53, 54, 57, 58). In the US Pacific island state of Hawai'i, where over a third of US NHOPI reside (56), about 20% of NHOPI adults have reported an asthma diagnosis (26, 53). In conjunction, and like many other racial populations more impacted by asthma (33, 39, 42, 43), NHOPI are also more likely to report lower measures of socioeconomic status (SES) such as less education, lower income levels, and unemployment (26, 34, 39, 41, 44).

However, health surveillance specifically for NHOPI has been lacking, with disease prevalence and incidence estimates difficult to obtain due to the common practice of aggregating NHOPI with Asians. As a result, there remains little known about NHOPI asthma prevalence. Moreover, the burden of asthma among NHOPI may be underestimated due to notably low asthma prevalence among Asians. Standards instituted in the US in 1997 that require separation of NHOPI and Asian racial categories are now enabling discovery and documentation of health-related characteristics of NHOPI.

It has long been recognized that SES strongly predicts many health outcomes, regardless of race: Disease incidence, morbidity, and mortality rates are typically worse in populations of the lowest SES. Moreover, the relationship between comparatively lower SES and worse health is often independent of poverty status or threshold income levels; even among the middle/upper classes, there can be a dose-response between relative SES gain and better health outcomes (59-61). However, relationships between socioeconomics and health can vary by race, with some racial groups experiencing fewer health benefits from improved SES (62-65). There is now growing recognition that socioeconomic factors combine with racialized categories to play a predominant but complex role in US health inequities (66-69), including those observed for asthma outcomes (19, 24, 46, 48). Indeed, interactions between SES and race should be expected, given that race is itself a complex socioeconomic and political construct without a biological basis (70, 71).

Lower SES measures are frequently associated with both asthma (5, 8, 12, 13, 18, 19, 22-24) and the racial populations that manifest higher asthma prevalence (33, 39, 42, 43), while many factors that can affect asthma incidence and/or severity (e.g., sex, age, body mass index (BMI), smoking, and healthcare) also covary with both SES and race (31-33, 35-40, 45, 49, 72). Despite the inclusion of these myriad socioeconomic and demographic potential confounders in many multivariable investigations, racial differences in the burden of asthma have been repeatedly shown to persist. That is, differences in common measures of SES and other population demographics have not simply explained US racial disparities in asthma (19, 24, 26, 28, 29, 46).

Thus, this dissertation is motivated by the need for further investigations that document and explore the relationships between race, SES, and other sociodemographics – especially in the context of long-standing and egregious health inequities by racial/social groupings in the US such as those that persist for asthma. The primary aim of the studies herein is to provide social epidemiologic findings regarding asthma prevalence in the US that may contribute to asthma prevention. An additional objective is to provide baseline (2001-2010) asthma surveillance information that will be useful to contemporary and future health disparity studies as environmental, social, and socioeconomic conditions change in the US. Lastly, this dissertation contributes an applied example of a methodological approach (i.e., dominance analysis) that is not commonly utilized in epidemiology but that can provide useful insights into complex systems phenomena such as social/racial disparities in asthma. Together, fulfillment of these objectives contributes to knowledge that will help to inform efforts that seek to eliminate health disparities and achieve health equity.

Human Subject Protections

These studies were classified as exempt by the University of Hawai‘i at Mānoa Institutional Review Board.

Inclusion of Previously Published Material

I previously investigated adult asthma prevalence disparities by race in the US using multiple years of Behavioral Risk Factor Surveillance System (BRFSS) survey data, with a focus on Native Hawaiian/Other Pacific Islander (NHOPI), in partial fulfillment of the requirements for the degree of Master of Science in Public Health at the University of Hawai‘i at Mānoa (73). Additionally, as a primary author I similarly investigated asthma prevalence disparities and sociodemographic associations with asthma by race within Hawai‘i, with published results (26).

These investigations motivated the more in-depth studies of this dissertation. Chapter 1 is similar to the work of my Master's thesis, but differs by: 1) Including additional BRFSS data (i.e., 2010); 2) excluding Alaska (due to small sample sizes for some strata); and 3) aggregating some racial groups (i.e., Black/African American and American Indian/Alaska Native, to enable inclusion of data from Hawai'i in stratifications and multivariable modeling for NHOPI estimates). Chapter 2 includes material from the previously published manuscript. However, Chapters 1 and 2 both differ from previous work by: a) Including additional adjustment covariates (i.e.,US census region, healthcare provider, and healthcare utilization); b) excluding an SES indicator covariate (to enable comparisons of subsequent model results with this factor); c) providing adjusted prevalence estimates using improved statistical models.

STUDY 1: ASTHMA PREVALENCE DISPARITIES AND DIFFERENCES IN SOCIODEMOGRAPHIC ASSOCIATIONS WITH ASTHMA AMONG NATIVE HAWAIIAN/OTHER PACIFIC ISLANDER, ASIAN, AND WHITE RACE IN THE UNITED STATES

INTRODUCTION

This study investigated the racial and sociodemographic factors involved in the US adult asthma epidemic during the decade between 2001-2010, with intent to address asthma knowledge gaps specifically regarding those who identify as Native Hawaiian/Other Pacific Islander (NHOPI).

The primary study aim was to document a nationwide baseline of the burden of asthma among NHOPI, as well as to investigate and describe national-level asthma disparities by race, as compared to Asians. That is, this study asked, 'Has asthma prevalence been elevated among NHOPI compared to Asians, Whites, and those of Other races in the US?; how has asthma prevalence differed among racial groups in the US, including NHOPI?'

The second objective of this study was to compare the magnitudes of asthma associations with sociodemographic factors among NHOPI, Asians, and Whites, and those of Other race, after controlling for multiple sociodemographic covariates. That is, this study asked, 'Within groupings by sex and race, how strong were associations with asthma for each of several known sociodemographic asthma risk factors (i.e., region, time period, age, BMI, smoking, healthcare coverage, and healthcare provider)?; are these asthma associations of the same strength regardless of sex and race, or does sex/race modify associations with asthma prevalence?'

Lastly, this investigation sought to describe geographic heterogeneity in asthma prevalence, with control for potential confounders. Specifically, this study sought to answer the question, 'Has there been excess asthma in the US state of Hawai'i?; among groupings by sex and race, is asthma prevalence different in Hawai'i than in the overall US population?'

Together these objectives will provide a comparative context for subsequent studies of the epidemiology of asthma within Hawai'i, including asthma among NHOPI in Hawai'i. To my knowledge, this is the first investigation to provide an in-depth characterization of asthma among NHOPI by examining nationwide multivariable-adjusted asthma prevalence estimates, with comparisons of adjusted asthma prevalence and potential asthma predictors by groupings of sex and race.

METHODS

Data Source

A sample size sufficient to meet the study aims for the relatively small NHOPI subpopulation in the US was uniquely available from multiple years of Behavioral Risk Factor Surveillance System (BRFSS) health survey data. Lifetime and current asthma prevalence among adults (≥ 18 years) living in households with telephones in the US was assessed using 2001 through 2010 BRFSS data. BRFSS is a continuous random-digit-dialed telephone health survey, conducted by US states in partnership with the Centers for Disease Control and Prevention (CDC), in which sociodemographic and health characteristics are self-reported. The BRFSS annual datasets were obtained from the CDC public website (http://www.cdc.gov/brfss) and included weights that permit statistical inferences to national/state-level populations and that reduce estimate bias from non-coverage and non-response.

Questions about asthma have been part of the core BRFSS survey since 2001. To provide sufficient sample sizes, nine years of BRFSS from 2001 through 2010 were aggregated; data were not available for year 2004 for Hawai'i and so all 2004 data were excluded. BRFSS data beyond year 2010 were not included due to changes in the survey's sampling design in 2011 that complicate comparability with earlier time periods. Data from the non-continental US other than Hawai'i were excluded (i.e., Alaska, Guam, Puerto Rico, and the US Virgin Islands) due either to very small numbers of NHOPI in these geographic regions or to disparate environmental/social conditions not sufficiently described by available covariates.

Dependent Variables – Lifetime and Current Asthma

Outcome variables were chosen from the two BRFSS questions regarding asthma prevalence: 1) Lifetime asthma, defined as a 'yes' answer to the question, 'Have you ever been told by a doctor, nurse, or other health professional that you had asthma?' and 2) Current asthma, defined as a 'yes' answer to the follow-up question, 'Do you still have asthma?' Frequency of missing for these outcome variables was less than 1%.

Independent Variables - Race

Race classification was derived from the questions, 'Which one or more of the following would you say is your race?', and if multiple races were indicated, 'Which one of these groups would you say best represents your race? (US census categories available for selection: White; Black or African American; Asian; Native Hawaiian or Other Pacific Islander (NHOPI);

American Indian or Alaska Native; Other; Don't know/Not sure)'. Survey respondents not best identifying as either NHOPI, White, or Asian were classified as Other race (including those not answering or indicating "Don't know/Not sure"); an analysis category solely for Black or African American race was not included due to its very small sample size in Hawai'i and this investigation's focus on NHOPI.

Independent Variables – Sociodemographics

In addition to sex (female/male), US Census region (i.e., respondent's state designated as in Hawai'i, West, Midwest, South, or Northeast (74)), and three-year time period (2001-2003, 2005-2007, or 2008-2010), other sociodemographic covariates were selected for analysis if they were available for every year and had a known association with asthma. Age responses were grouped into three categories for sufficient sample sizes (18-34, 35-64, ≥ 65 years). Categories for body mass index (BMI; weight/height^2) were assigned using CDC definitions (not overweight/obese, BMI < 25; overweight (OW), 25 ≤ BMI < 30; obese (OB), BMI ≥ 30). A smoking status of 'never' was defined as a 'no' answer to the question, 'Have you smoked at least 100 cigarettes in your entire life?'; if 'yes', a respondent was categorized as an 'ever-smoker'. Possession of healthcare coverage was derived from the question, 'Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?'. Having ready access to healthcare was assessed with the question, 'Do you have one person you think of as your personal doctor or health care provider?'. A proxy for healthcare utilization within the past two years was derived from the question, 'About how long has it been since you last visited a doctor for a routine checkup?' (not asked in 2003; data for this variable were excluded from the 2001-2003 time period). Frequency of missing for each of the above covariates was less than 1.5%, except for BMI which had a frequency of missing of 4%.

Table 1.1 summarizes the outcome and independent sociodemographic variables utilized by this study.

Table 1.1. Study asthma outcome and independent sociodemographic variables from the Behavioral Risk Factor Surveillance System data, 2001-2010.

Variable	BRFSS Survey Question	Response Categories Analyzed
Lifetime asthma	'Have you ever been told by a doctor, nurse, or other health professional that you had asthma?'	Yes or No
Current asthma	If 'Yes' to lifetime asthma, 'Do you still have asthma?'	Yes or No
Sex	Indicate sex of respondent.	Female or Male
Race	'Which one or more of the following would you say is your race?' If multiple races were indicated, 'Which one of these groups would you say best represents your race?	US Census categories: Native Hawaiian or Other Pacific Islander (NHOPI); White; Asian; Other (includes survey responses of: Black or African American; American Indian or Alaska Native; Other; Don't know/Not sure)
Region	US region of survey	West[a], Midwest[b], South[c], Northeast[d], or Hawai'i. Excludes Alaska, Guam, Puerto Rico, and the US Virgin Islands
Time period	3-year time period of survey	2001-2003, 2005-2007, or 2008-2010. Data from 2004 excluded due to missing data
Age	What is your age?	18-34, 35-64, or ≥ 65 years
Body Mass Index (BMI)	Weight/Height^2, derived from the questions, 'About how much do you weigh without shoes?', and 'About how tall are you without shoes?'	Not overweight/obese, BMI < 25; Overweight, 25 ≤ BMI < 30; Obese, BMI ≥ 30
Smoking	'Have you smoked at least 100 cigarettes in your entire life?'	(Yes) Ever-Smoker or (No) Never-Smoker
Healthcare coverage	'Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?'	Yes or No
Healthcare provider	'Do you have one person you think of as your personal doctor or health care provider?'	Yes or No
Healthcare utilization	'About how long has it been since you last visited a doctor for a routine checkup?'	Yes if last visited a doctor for a routine checkup within the past two years, otherwise No. Note: No data for the 2001-2003 time period

Table 1.1. (Continued) Study asthma outcome and independent sociodemographic variables from the Behavioral Risk Factor Surveillance System data, 2001-2010.

[a]West: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.
[b]Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin.
[c]South: Alabama, Arkansas, Delaware, D.C., Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia.
[d]Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont.

Statistical Analyses

Analyses were conducted using the dataset of the entire continental US plus Hawai'i. All statistical analyses were conducted using SAS-callable SUDAAN (version 11.0; RTI International, Raleigh, NC), accounting for the complex sampling design of BRFSS. SUDAAN's 'subpopx' statement was used to define subpopulations, and Taylor series linearization was used for variance estimation. For inferences to the state and regional levels, annual survey weights were made equally proportional (i.e., were divided by the number of aggregated years). All strata with a numerator of N < 25 were excluded from analyses. Coefficients of variation (COV), which quantify sampling variability of an estimator, were calculated using SAS 'Surveyfreq' (version 9.4; SAS Institute, Cary, NC) to confirm asthma prevalence estimate reliability (i.e., COV < 30%) for denominator strata having small sample sizes (N < 100).

Logistic regression models of asthma prevalence were fit to the subset 2005-2010 dataset for the covariate of healthcare utilization; otherwise models were fit to the entire 2001-2010 dataset. The sociodemographic covariates of region, time period, age, BMI, smoking status, and healthcare provider remained significant (p-value < 0.05) in multivariable models using the overall US population, and so were retained in all models. Although not always statistically significant, healthcare coverage was also retained in all models due to its possible importance as a potential confounder within some strata. To rule out the presence of multi-collinearity in multivariable models, the SAS procedure 'proc reg' was used for the calculation of collinearity tolerance estimates. Final analyses were conducted separately for women and men because sex strongly modifies many asthma associations (15, 21, 26). In addition, because asthma is known to vary greatly by geographic region (5, 8, 12), two-way interactions between region and each of the other covariates were tested together within all sex/race strata, with significant interactions retained in the final model. The multivariable model was not run for current asthma among male NHOPI due to insufficient sample sizes or the Midwest region.

Because odds ratios from a logistic regression model will overestimate the strength of association when the outcome is not rare, model-adjusted prevalence ratios (aPRs) from predicted marginals were instead used to quantify and assess associations (75, 76). Such estimates can be more easily interpretable than probability odds, while permitting comparisons of the predicted outcome among groups after controlling for the differences in the distributions of the covariates. Moreover, predictive margins with survey data readily enable assessment of group effects on the outcome when interactions are present in the model (76). Briefly, predicted marginals adjust for covariate differences among groups in a way similar to traditional epidemiologic standardization, by computing the predicted prevalence for a particular group

using the group's own risk of the outcome for each covariate but given the covariate distribution of the remaining population. That is, aPRs answer the question, 'What would the prevalence be in this subgroup, if the subgroup had the covariate distribution of all others in the sample?'

Prevalence ratios were conservatively considered significant when 95% confidence intervals (CI) excluded 1.0, and differences between prevalence estimates and prevalence ratios were considered meaningful when CIs did not overlap. Data visualizations were conducted using Tableau (version 10.5).

RESULTS

Racial and Sociodemographic Diversity in the United States

The combined continental US and Hawai'i BRFSS dataset for 2001-2010 was comprised of 3,078,504 records, of which 12,475 identified as NHOPI (Table 1.2). Over 74% of the survey responses from those identifying as NHOPI, and 58% from Asian, originated in Hawai'i or western states (Table 1.3). Over half (52%) of responses by those of Other race were from the South, while responses from Whites were more evenly distributed regionally (Table 1.4). Among those categorized as Other race, 62% identified as Black or African American outside of Hawai'i and the Western region, compared to 24% and 35% in Hawai'i and the West, respectively (Appendix Table 5.1). While 54% percent of BRFSS records for NHOPI were from Hawai'i, the largest weighted population size estimate for NHOPI was from the continental US Western region. Weighted population sizes were largest in the South for Whites and those of Other Race, but the Asian population was largest in the West.

Compared with Whites and Asians of the same sex, NHOPI were more often male and younger, and reported lack of healthcare coverage or provider more frequently (Tables 1.3 and 1.4, and Appendix Tables 5.2 thru 5.5). Asthma risk factors of obesity and ever-smoking were more common among NHOPI and Whites than among Asians. Obesity was more common among NHOPI, White, and Asian males than females of the same race, and males of all races also reported lack of healthcare coverage or a provider more often than females. Ever-smoking was most frequently reported by Whites and least frequently reported by Asians, but regardless of race smoking was more common among males than females. While Whites reported having a personal healthcare provider most frequently, women of Other race were the most likely to have recently utilized healthcare. Those of Other race also reported the largest population proportions for obese BMI and lack of healthcare coverage or provider.

Table 1.2. United States – Sample sizes, weighted population characteristics, crude asthma prevalence, and unadjusted sociodemographic associations with asthma - Behavioral Risk Factor Surveillance System data, 2001-2010.

United States			Lifetime asthma		Current asthma	
	Sample size	Population characteristics, % (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)
Total	3,078,504	100.0	12.6 (12.5,12.7)		8.0 (8.0,8.1)	
Sex: Female	1,900,165	51.5 (51.4,51.6)	14.3 (14.2,14.4)	1.3 (1.3,1.3)	10.0 (9.9,10.0)	1.7 (1.6,1.7)
Sex: Male	1,178,339	48.5 (48.4,48.6)	10.8 (10.7,10.9)	1.0 (ref)	6.0 (5.9,6.1)	1.0 (ref)
Race: NHOPI	12,475	0.5 (0.5,0.5)	16.5 (14.8,18.4)	2.0 (1.7,2.2)	8.7 (7.7,9.9)	2.1 (1.8,2.4)
Race: White	2,585,364	78.2 (78.1,78.3)	12.5 (12.4,12.6)	1.5 (1.4,1.6)	8.0 (8.0,8.1)	1.9 (1.8,2.1)
Race: Other	423,268	18.2 (18.1,18.3)	13.6 (13.4,13.8)	1.6 (1.5,1.7)	8.8 (8.6,8.9)	2.1 (1.9,2.3)
Race: Asian	57,397	3.2 (3.1,3.2)	8.4 (7.9,8.9)	1.0 (ref)	4.2 (3.9,4.5)	1.0 (ref)
Region: Hawai'i	54,103	0.4 (0.4,0.4)	14.7 (14.3,15.1)	1.2 (1.2,1.3)	8.0 (7.7,8.3)	1.1 (1.0,1.1)
Region: West	682,121	22.2 (22.1,22.2)	13.3 (13.1,13.5)	1.1 (1.1,1.1)	8.1 (7.9,8.3)	1.1 (1.1,1.1)
Region: Midwest	675,194	22.3 (22.2,22.3)	12.5 (12.3,12.6)	1.1 (1.0,1.1)	8.4 (8.3,8.5)	1.1 (1.1,1.1)
Region: Northeast	619,016	18.8 (18.7,18.9)	13.1 (12.9,13.3)	1.1 (1.1,1.1)	8.8 (8.6,8.9)	1.2 (1.2,1.2)
Region: South	1,048,070	36.3 (36.3,36.4)	11.9 (11.7,12.0)	1.0 (ref)	7.4 (7.3,7.5)	1.0 (ref)
Time period: 2008-2010	1,269,208	34.6 (34.5,34.7)	13.4 (13.3,13.5)	1.2 (1.1,1.2)	8.5 (8.4,8.6)	1.1 (1.1,1.2)
Time period: 2005-2007	1,113,996	33.4 (33.4,33.5)	12.7 (12.6,12.9)	1.1 (1.1,1.1)	8.1 (8.0,8.2)	1.1 (1.1,1.1)
Time period: 2001-2003	695,300	32.0 (31.9,32.0)	11.6 (11.4,11.7)	1.0 (ref)	7.5 (7.4,7.6)	1.0 (ref)
Age: 18-34 years	488,253	30.3 (30.2,30.4)	14.7 (14.6,14.9)	1.4 (1.4,1.4)	8.5 (8.4,8.7)	1.1 (1.1,1.2)
Age: 35-64 years	1,719,643	52.6 (52.5,52.8)	12.0 (11.9,12.1)	1.1 (1.1,1.2)	8.0 (7.9,8.1)	1.1 (1.1,1.1)
Age: >=65 years	844,026	17.0 (17.0,17.1)	10.5 (10.4,10.7)	1.0 (ref)	7.4 (7.3,7.6)	1.0 (ref)

Table 1.2. (Continued) United States – Sample sizes, weighted population characteristics, crude asthma prevalence, and unadjusted sociodemographic associations with asthma - Behavioral Risk Factor Surveillance System data, 2001-2010.

United States			Lifetime asthma		Current asthma	
	Sample size	Population characteristics, % (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)
BMI: Obese	715,606	22.5 (22.4,22.6)	16.5 (16.3,16.7)	1.4 (1.4,1.5)	11.4 (11.2,11.5)	1.6 (1.6,1.6)
BMI: Overweight	987,220	32.4 (32.3,32.5)	11.5 (11.3,11.6)	1.0 (1.0,1.0)	7.1 (7.0,7.2)	1.0 (1.0,1.0)
BMI: Not OW/OB	1,242,405	45.0 (44.9,45.2)	11.5 (11.4,11.6)	1.0 (ref)	7.1 (7.0,7.1)	1.0 (ref)
Smoke: Ever	1,454,244	44.6 (44.5,44.7)	13.7 (13.6,13.8)	1.2 (1.2,1.2)	8.9 (8.9,9.0)	1.2 (1.2,1.2)
Smoke: Never	1,610,397	55.4 (55.3,55.5)	11.7 (11.6,11.8)	1.0 (ref)	7.3 (7.3,7.4)	1.0 (ref)
Healthcare coverage: Yes	2,720,497	84.7 (84.6,84.8)	12.6 (12.6,12.7)	1.0 (1.0,1.1)	8.2 (8.1,8.2)	1.1 (1.1,1.1)
Healthcare coverage: No	350,096	15.3 (15.2,15.4)	12.2 (11.9,12.4)	1.0 (ref)	7.3 (7.1,7.5)	1.0 (ref)
Healthcare provider: Yes	2,631,586	80.2 (80.1,80.3)	13.1 (13.0,13.2)	1.3 (1.2,1.3)	8.7 (8.6,8.7)	1.6 (1.5,1.6)
Healthcare provider: No	436,230	19.8 (19.7,19.9)	10.4 (10.2,10.6)	1.0 (ref)	5.5 (5.4,5.7)	1.0 (ref)
Healthcare utilization: Yes	1,986,830	81.7 (81.6,81.9)	13.3 (13.2,13.4)	1.1 (1.1,1.1)	8.7 (8.6,8.7)	1.3 (1.2,1.3)
Healthcare utilization: No	367,178	18.3 (18.1,18.4)	11.9 (11.7,12.2)	1.0 (ref)	6.8 (6.6,6.9)	1.0 (ref)
Healthcare utilization includes only 2005-2010 data due to missing in the earlier time period.						

Table 1.3. United States, by Native Hawaiian/Other Pacific Islander (NHOPI) or Asian race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI			Asian		
	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)
Total	12,475	1,063,319	100.0	57,397	7,064,421	100.0
Sex: Female	7,340	469,351	44.1 (41.9,46.4)	33,223	3,208,889	45.4 (44.5,46.3)
Sex: Male	5,135	593,968	55.9 (53.6,58.1)	24,174	3,855,533	54.6 (53.7,55.5)
Region: Hawai‘i	6,675	134,680	12.7 (12.0,13.4)	21,359	448,441	6.3 (6.2,6.5)
Region: West	2,547	466,988	43.9 (41.5,46.3)	11,747	2,722,176	38.5 (37.6,39.4)
Region: Midwest	767	99,852	9.4 (8.3,10.7)	4,972	854,706	12.1 (11.6,12.6)
Region: Northeast	1,024	145,555	13.7 (12.2,15.3)	10,422	1,530,561	21.7 (21.0,22.3)
Region: South	1,462	216,244	20.3 (18.6,22.1)	8,897	1,508,538	21.4 (20.6,22.1)
Time period: 2008-2010	4,596	358,542	33.7 (31.7,35.8)	22,987	2,717,117	38.5 (37.6,39.3)
Time period: 2005-2007	4,591	371,011	34.9 (32.7,37.2)	19,647	2,259,790	32.0 (31.2,32.8)
Time period: 2001-2003	3,288	333,766	31.4 (29.2,33.7)	14,763	2,087,515	29.5 (28.7,30.4)
Age: 18-34 years	3,926	523,567	49.5 (47.1,51.8)	14,525	2,785,725	39.8 (38.9,40.7)
Age: 35-64 years	6,782	466,054	44.0 (41.8,46.3)	32,077	3,600,117	51.5 (50.6,52.4)
Age: >=65 years	1,686	68,736	6.5 (5.6,7.5)	10,007	610,020	8.7 (8.2,9.2)
BMI: Obese	3,777	222,439	21.6 (19.9,23.5)	5,020	484,974	7.1 (6.7,7.6)
BMI: Overweight	3,771	325,863	31.7 (29.5,34.0)	15,359	1,843,411	27.2 (26.4,28.0)
BMI: Not OW/OB	4,583	479,911	46.7 (44.3,49.1)	35,039	4,460,926	65.7 (64.8,66.6)
Smoke: Ever	5,894	421,193	39.8 (37.5,42.1)	16,321	1,741,114	24.8 (24.1,25.6)
Smoke: Never	6,533	636,841	60.2 (57.9,62.5)	40,766	5,270,049	75.2 (74.4,75.9)

Table 1.3. (Continued) United States, by Native Hawaiian/Other Pacific Islander (NHOPI) or Asian race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI			Asian		
	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)
Healthcare coverage: Yes	10,741	855,242	81.2 (79.3,83.0)	52,335	6,151,076	87.5 (86.9,88.2)
Healthcare coverage: No	1,670	197,797	18.8 (17.0,20.7)	4,882	875,181	12.5 (11.8,13.1)
Healthcare provider: Yes	10,181	795,120	75.3 (73.2,77.3)	48,152	5,393,875	76.9 (76.1,77.8)
Healthcare provider: No	2,238	260,304	24.7 (22.7,26.8)	8,943	1,618,655	23.1 (22.2,23.9)
Healthcare utilization: Yes	7,348	890,014	82.1 (80.1,83.9)	35,347	6,106,918	82.6 (81.8,83.5)
Healthcare utilization: No	1,737	194,563	17.9 (16.1,19.9)	6,746	1,282,799	17.4 (16.5,18.2)
Healthcare utilization includes only 2005-2010 data due to missing in the earlier time period.						

Table 1.4. United States, by White or Other race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White			Other Race		
	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)
Total	2,585,364	174,291,992	100.0	423,268	40,563,792	100.0
Sex: Female	1,586,418	90,347,619	51.8 (51.7,52.0)	273,184	20,798,440	51.3 (51.0,51.6)
Sex: Male	998,946	83,944,374	48.2 (48.0,48.3)	150,084	19,765,352	48.7 (48.4,49.0)
Region: Hawai'i	22,936	331,409	0.2 (0.2,0.2)	3,133	60,233	0.1 (0.1,0.2)
Region: West	604,089	39,842,376	22.9 (22.8,22.9)	63,738	6,389,102	15.8 (15.5,16.0)
Region: Midwest	602,016	42,509,829	24.4 (24.3,24.5)	67,439	6,186,133	15.3 (15.1,15.4)
Region: Northeast	537,164	32,776,187	18.8 (18.7,18.9)	70,406	7,467,649	18.4 (18.2,18.6)
Region: South	819,159	58,832,191	33.8 (33.7,33.8)	218,552	20,460,675	50.4 (50.1,50.7)
Time period: 2008-2010	1,070,165	60,147,908	34.5 (34.4,34.6)	171,460	13,925,426	34.3 (34.1,34.6)
Time period: 2005-2007	933,407	57,836,274	33.2 (33.1,33.3)	156,351	14,114,768	34.8 (34.5,35.1)
Time period: 2001-2003	581,792	56,307,810	32.3 (32.2,32.4)	95,457	12,523,597	30.9 (30.6,31.1)
Age: 18-34 years	369,652	48,332,329	27.9 (27.7,28.0)	100,150	15,519,308	38.7 (38.4,39.0)
Age: 35-64 years	1,444,451	92,553,663	53.4 (53.2,53.5)	236,333	20,037,676	50.0 (49.6,50.3)
Age: >=65 years	752,729	32,530,271	18.8 (18.7,18.8)	79,604	4,549,964	11.3 (11.2,11.5)
BMI: Obese	574,831	36,435,827	21.7 (21.6,21.8)	131,978	11,032,643	29.0 (28.7,29.3)
BMI: Overweight	838,901	54,922,400	32.7 (32.6,32.8)	129,189	12,261,575	32.2 (31.9,32.5)
BMI: Not OW/OB	1,069,110	76,635,286	45.6 (45.5,45.7)	133,673	14,743,148	38.8 (38.4,39.1)
Smoke: Ever	1,253,422	81,157,754	46.8 (46.7,46.9)	178,607	15,675,688	38.9 (38.6,39.2)
Smoke: Never	1,321,079	92,341,442	53.2 (53.1,53.3)	242,019	24,632,286	61.1 (60.8,61.4)

Table 1.4. (Continued) United States, by White or Other race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White			Other Race		
	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)
Healthcare coverage: Yes	2,325,864	151,230,035	87.1 (87.0,87.2)	331,557	29,816,349	74.0 (73.7,74.2)
Healthcare coverage: No	253,732	22,488,788	12.9 (12.8,13.0)	89,812	10,503,051	26.0 (25.8,26.3)
Healthcare provider: Yes	2,241,315	142,674,547	82.3 (82.2,82.4)	331,938	28,963,700	71.9 (71.6,72.2)
Healthcare provider: No	335,897	30,671,047	17.7 (17.6,17.8)	89,152	11,297,869	28.1 (27.8,28.4)
Healthcare utilization: Yes	1,662,313	142,035,609	81.2 (81.0,81.3)	281,822	34,900,633	84.0 (83.7,84.3)
Healthcare utilization: No	317,082	32,966,366	18.8 (18.7,19.0)	41,613	6,649,748	16.0 (15.7,16.3)
Healthcare utilization includes only 2005-2010 data due to missing in the earlier time period.						

Overall Asthma Prevalence and Associations in the United States

In the overall US population, the crude prevalence of having ever been diagnosed with asthma was 12.6%, and prevalence of currently having asthma was 8.0% (Table 1.2). However, asthma prevalence varied by sociodemographic characteristic. For example, both lifetime and current asthma prevalence estimates were independently and strongly associated with female sex, obesity, and having a healthcare provider. Asthma prevalence was also consistently and independently associated with all other sociodemographic covariates except healthcare coverage (i.e., US regions other than the South, the latter two time periods, younger age (< 65 years), ever-smoking, and healthcare utilization); crude prevalence of current, but not lifetime, asthma was related to having health care coverage.

Asthma Prevalence Disparities By Race in the United States

Those identifying as NHOPI had the highest unadjusted prevalence estimates for lifetime asthma (16.5%), and much higher prevalence of current asthma (8.7%) than Asians (4.2%) (Table 1.2). Compared to Asians, prevalence of current asthma was greatly elevated among both NHOPI and those of Other race (PR=2.1), as well as for Whites (PR=1.9). Having ever had a diagnosis of asthma was twice as common among NHOPI (PR=2.0) compared to Asians (P%=8.4%), while lifetime asthma was also much more frequent among those of Other race (PR=1.6) and Whites (PR=1.5).

However, racial disparities in asthma prevalence were modified by sex (Tables 1.5). For example, both lifetime and current asthma were much more common among Whites and those of Other race than among Asians, but more so for women than for men. Similarly, crude lifetime asthma prevalence was elevated among women (14.3%) compared to men (10.8%), as was current asthma (10.0% among women, 6.0% among men), but asthma associations with sex were modified by race (Table 1.6). For example, women were significantly more likely than men to report current asthma, but more so for NHOPI, Whites, and Other race than Asian women.

Table 1.5. United States, by sex or race - Lifetime asthma crude prevalence and unadjusted race/sex associations with lifetime asthma - Behavioral Risk Factor Surveillance System, 2001-2010.

United States		Associations between asthma and race	Associations between asthma and sex
Women – Lifetime asthma			
	Prevalence, P% (95%CI)	**Prevalence ratio, PR (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	17.6 (15.5,19.9)	2.0 (1.7,2.3)	1.1 (0.9,1.4)
Race: White	14.1 (14.0,14.2)	1.6 (1.5,1.7)	1.3 (1.3,1.3)
Race: Other	15.7 (15.4,15.9)	1.8 (1.7,1.9)	1.4 (1.3,1.4)
Race: Asian	8.8 (8.1,9.4)	1.0 (ref)	1.1 (1.0,1.2)
Men – Lifetime asthma			
	Prevalence, P% (95%CI)	**Prevalence ratio, PR (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	15.7 (13.2,18.6)	1.9 (1.6,2.4)	1.0(ref)
Race: White	10.7 (10.6,10.9)	1.3 (1.2,1.5)	1.0(ref)
Race: Other	11.4 (11.0,11.7)	1.4 (1.3,1.5)	1.0(ref)
Race: Asian	8.1 (7.4,8.8)	1.0(ref)	1.0(ref)

Table 1.6. United States, by sex or race - Current asthma crude prevalence and unadjusted race/sex associations with current asthma - Behavioral Risk Factor Surveillance System, 2001-2010.

United States		Associations between asthma and race	Associations between asthma and sex
Women – Current asthma			
	Prevalence, P% (95%CI)	**Prevalence ratio, PR (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	11.2(9.5,13.1)	2.3(1.9,2.8)	1.6(1.3,2.2)
Race: White	9.9(9.8,10.0)	2.1(1.9,2.3)	1.6(1.6,1.7)
Race: Other	11.1(10.9,11.4)	2.3(2.1,2.6)	1.8(1.7,1.9)
Race: Asian	4.8(4.3,5.3)	1.0(ref)	1.3(1.1,1.5)
Men – Current asthma			
	Prevalence, P% (95%CI)	**Prevalence ratio, PR (95%CI)**	**Prevalence ratio, PR (95% CI)**
Race: NHOPI	6.8(5.5,8.4)	1.8(1.4,2.3)	1.0(ref)
Race: White	6.0(5.9,6.1)	1.6(1.4,1.8)	1.0(ref)
Race: Other	6.3(6.0,6.5)	1.7(1.5,1.9)	1.0(ref)
Race: Asian	3.7(3.3,4.2)	1.0(ref)	1.0(ref)

Asthma in the United States Among Women and Men, By Race

After stratifying by sex and race and controlling for other covariates within each sex/race grouping, meaningful increases in asthma prevalence with time were greater among males than females (Tables 1.7 thru 1.14). Asthma ever-diagnoses were especially more frequent among Asian men in 2008-2010 compared to 2001-2003 (aPR=1.4). Increased adjusted lifetime asthma prevalence during the latter time periods was statistically significant for NHOPI men in 2005-2007 but not 2008-2010. Current asthma prevalence was 20% more prevalent among White men in 2008-2010 than in 2001-2003. However, large confidence intervals for NHOPI asthma estimates, and insufficient sample size for current asthma among NHOPI men, limited inferences for this racial grouping.

Young age (18-34 years) was strongly associated with asthma among Whites and those categorized as Other race, and much more so among men than women for lifetime asthma (Tables 1.7 thru 1.14). Among Asians, lifetime asthma, but not current asthma, was also higher among those reporting young age compared to the eldest age group (≥ 65 years).

There were meaningful associations between obesity and asthma among all races regardless of sex, with stronger associations among White and Other race women compared to men of the same race (Tables 1.7 thru 1.14). Lifetime asthma was more strongly associated with obesity among Asian men (aPR=2.0), than among White (aPR=1.2) or Other race (aPR=1.1) men. Moreover, current asthma was more strongly associated with obesity than lifetime asthma for White and Other race women, and marginally more so for NHOPI and all Asians. Associations between obesity and current asthma were strongest for Asians (e.g., aPR=2.5 Asian women, aPR=2.2 Asian men), and were meaningfully greater than for Whites and Other race of the same sex. Overweight BMI was associated with elevated asthma prevalence as compared to normal BMI only among women, but especially for Asian women; current asthma was more strongly associated with overweight among Asian women (apR=1.7), than among White (apR=1.2) or Other race (aPR=1.1) women.

Asthma prevalence was elevated among ever-smokers compared to never-smokers, except among Asian men, and more so for women than men: Reports of an asthma ever-diagnosis and/or current asthma were more common among White, Other race, and Asian women reporting ever-smoking than among men (Tables 1.7 thru 1.14). Among Asian women the association between ever-smoking and asthma was uniquely somewhat less for current than for lifetime asthma.

Associations between having healthcare coverage and asthma prevalence, after controlling for other covariates, were meaningfully demonstrated only among females of NHOPI

or Other race (Tables 1.7 thru 1.14). However, healthcare coverage associations with asthma were marginally also present among Asians. In contrast, having healthcare coverage was not associated with asthma among Whites. Both lifetime and current asthma were consistently more common among those having a healthcare provider, except among NHOPI men reporting lifetime asthma. Recent healthcare utilization was meaningfully associated with asthma prevalence among White and Other race men reporting current asthma. However, smaller sample sizes for the healthcare utilization covariate (data available for 2005-2010 only) likely reduced power to detect differences within some strata.

Geographic Associations with Asthma Prevalence, By Sex and Race

Both lifetime and current asthma were reported least frequently in the South, with asthma ever-diagnoses about 10% more common in the West, Midwest, and Northeast (Table 1.2). Unadjusted prevalence of lifetime asthma, but not current asthma, was higher in Hawai‘i than in any other region in the US, with prevalence about 20% higher than in the South (i.e., P%=14.7% in Hawai‘i; P%=11.9% in the South). Lifetime asthma prevalence was associated with the West (P%=13.3%), Midwestern (P%=12.5%), and Northeastern (P%=13.1%) regions of the US, compared to the South. Current asthma was more common in the Midwest (P%=8.4%) than in either the West (P%=8.1%) or Hawai‘i (P%=8.0%), but current asthma was reported most often in the Northeast (P%=8.8%; PR=1.2, compared to the South).

However, geographic patterns of asthma prevalence depended on type of asthma as well as race and/or sex, including after controlling for other covariates (Tables 1.7 thru 1.14). For example, among NHOPI women adjusted asthma prevalence was substantially higher in Hawai‘i or the West compared to the South; NHOPI women in Hawai‘i were 60% more likely to have had an asthma ever-diagnosis than in the South, and 2.5 times more likely to report current asthma. Moreover, point estimates of lifetime asthma prevalence were higher for NHOPI women and men residing in Hawai‘i or the West than for those in the Northeast. Among White women, asthma prevalence was highest in Hawai‘i than any other region of the US; among White men, lifetime but not current asthma was higher in Hawai‘i or the West than in the other US regions. Among Asians an asthma ever-diagnosis was strongly associated with residence in Hawai‘i, with adjusted lifetime asthma higher in Hawai‘i than in the Midwest or Northeast.

Adjustment for covariates within sex/race groupings often somewhat altered associations between asthma and some characteristics (Tables 1.7 thru 1.14). However, attenuation of prevalence ratios was never more than 20%, except for the estimates of asthma prevalence among NHOPI women in Hawai‘i compared to the US South, and for the estimates of current asthma prevalence among NHOPI and Asian women with healthcare coverage. In

addition, some crude asthma prevalence estimates were potentially negatively confounded by more than 20%, such as asthma prevalence among young (18-34 years) Asian and Other race women. Despite these instances of changes by 20% or more between crude and adjusted asthma prevalence estimates by sex and race, there were only a few meaningful differences: Among Whites and those of Other race, estimates of both lifetime and current asthma prevalence were substantially higher after adjustment for age 18-34 compared to the oldest age grouping; among White men, the association between having healthcare coverage and lifetime asthma was substantially stronger after adjustment for other covariates.

Table 1.7. United States, Native Hawaiian/Other Pacific Islander (NHOPI) women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	22.9 (21.2,24.8)	2.1 (1.4,3.0)	1.6 (1.1,2.3)	15.6 (14.1,17.2)	3.4 (2.4,4.9)	2.5 (1.8,3.6)
Region: West	19.2 (15.4,23.8)	1.7 (1.1,2.6)	1.6 (1.0,2.4)	12.3 (9.2,16.3)	2.7 (1.7,4.3)	2.4 (1.5,3.7)
Region: Midwest	17.8 (12.8,24.2)	1.6 (1.0,2.6)	1.5 (0.9,2.4)	10.3 (6.8,15.3)	2.3 (1.3,3.9)	2.1 (1.2,3.6)
Region: Northeast	16.1 (11.3,22.5)	1.4 (0.9,2.4)	1.3 (0.8,2.1)	12.9 (8.5,19.2)	2.8 (1.7,4.9)	2.6 (1.5,4.4)
Region: South	11.2 (7.7,15.8)	1.0 (ref)	1.0 (ref)	4.5 (3.2,6.4)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	17.0 (14.2,20.2)	1.0 (0.7,1.4)	0.9 (0.7,1.3)	10.1 (8.3,12.2)	0.8 (0.6,1.2)	0.7 (0.5,1.1)
Time period: 2005-2007	18.5 (15.1,22.4)	1.1 (0.8,1.5)	1.0 (0.8,1.5)	11.2 (8.6,14.3)	0.9 (0.6,1.4)	0.9 (0.6,1.3)
Time period: 2001-2003	17.3 (13.1,22.4)	1.0 (ref)	1.0 (ref)	12.3 (8.7,17.1)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	17.3 (14.0,21.2)	0.9 (0.6,1.5)	1.0 (0.7,1.7)	10.3 (7.8,13.5)	1.0 (0.5,2.0)	1.2 (0.6,2.3)
Age: 35-64 years	17.9 (15.2,20.9)	0.9 (0.6,1.5)	1.0 (0.6,1.5)	12.2 (10.0,14.9)	1.2 (0.6,2.4)	1.2 (0.6,2.4)
Age: >=65 years	18.9 (12.0,28.5)	1.0 (ref)	1.0 (ref)	10.2 (5.2,19.1)	1.0 (ref)	1.0 (ref)
BMI: Obese	24.4 (19.7,29.8)	1.5 (1.2,2.1)	1.4 (1.1,1.9)	16.2 (12.5,20.6)	1.8 (1.3,2.7)	1.8 (1.2,2.6)
BMI: Overweight	17.2 (13.5,21.6)	1.1 (0.8,1.5)	1.0 (0.8,1.4)	12.9 (9.6,17.2)	1.5 (1.0,2.2)	1.4 (1.0,2.1)
BMI: Not OW/OB	15.8 (12.9,19.3)	1.0 (ref)	1.0 (ref)	8.7 (6.6,11.5)	1.0 (ref)	1.0 (ref)
Smoke: Ever	23.1 (19.2,27.4)	1.5 (1.2,2.0)	1.5 (1.2,1.9)	15.1 (11.9,19.0)	1.6 (1.2,2.3)	1.6 (1.1,2.2)
Smoke: Never	14.9 (12.5,17.6)	1.0 (ref)	1.0 (ref)	9.2 (7.4,11.4)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	18.8 (16.4,21.4)	1.7 (1.2,2.3)	1.5 (1.0,2.1)	11.9 (10.0,14.1)	1.7 (1.1,2.6)	1.3 (0.8,2.0)
Healthcare coverage: No	11.1 (8.2,14.9)	1.0 (ref)	1.0 (ref)	7.1 (4.7,10.5)	1.0 (ref)	1.0 (ref)

Table 1.7. (Continued) United States, Native Hawaiian/Other Pacific Islander (NHOPI) women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	18.4 (16.1,21.0)	1.3 (0.9,1.9)	1.3 (0.8,2.0)	11.9 (10.0,14.1)	1.5 (1.0,2.3)	1.3 (0.9,2.1)
Healthcare provider: No	13.8 (9.7,19.2)	1.0 (ref)	1.0 (ref)	7.8 (5.4,11.0)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	18.0 (15.6,20.8)	1.1 (0.8,1.6)	1.0 (0.7,1.5)	10.6 (8.8,12.7)	1.0 (0.7,1.5)	0.9 (0.6,1.4)
Healthcare utilization: No	16.2 (11.8,21.9)	1.0 (ref)	1.0 (ref)	10.7 (7.3,15.2)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and any significant interactions between a covariate and region. Models for associations with healthcare utilization were run only for 2005-2010 data due to missing in the earlier time period.						

Table 1.8. United States, Native Hawaiian/Other Pacific Islander (NHOPI) men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	18.7 (16.6,21.0)	1.5 (1.1,2.1)	1.4 (1.0,2.0)	8.4 (7.0,10.1)	1.3 (0.7,2.2)	NA
Region: West	17.0 (12.5,22.8)	1.4 (0.9,2.1)	1.4 (0.9,2.1)	6.5 (4.5,9.4)	1.0 (0.5,1.9)	NA
Region: Midwest	16.8 (10.7,25.3)	1.3 (0.8,2.3)	1.2 (0.7,2.2)	NA	NA	NA
Region: Northeast	12.6 (8.5,18.3)	1.0 (0.6,1.7)	1.0 (0.6,1.6)	7.2 (4.4,11.6)	1.1 (0.5,2.2)	NA
Region: South	12.6 (9.1,17.2)	1.0 (ref)	1.0 (ref)	6.6 (3.9,10.8)	1.0 (ref)	NA
Time period: 2008-2010	14.7 (11.5,18.5)	1.2 (0.8,1.8)	1.2 (0.8,1.8)	7.8 (5.5,10.9)	1.8 (1.0,3.3)	NA
Time period: 2005-2007	19.8 (14.6,26.2)	1.6 (1.1,2.5)	1.6 (1.1,2.5)	8.0 (5.7,11.2)	1.9 (1.1,3.4)	NA
Time period: 2001-2003	12.1 (8.9,16.2)	1.0 (ref)	1.0 (ref)	4.2 (2.6,6.7)	1.0 (ref)	NA
Age: 18-34 years	17.4 (13.5,22.3)	1.1 (0.5,2.2)	1.2 (0.6,2.4)	6.1 (4.4,8.4)	0.8 (0.4,1.9)	NA
Age: 35-64 years	13.6 (11.0,16.8)	0.9 (0.4,1.7)	0.9 (0.5,1.7)	7.6 (5.6,10.3)	1.1 (0.5,2.4)	NA
Age: >=65 years	15.9 (7.9,29.2)	1.0 (ref)	1.0 (ref)	7.2 (3.3,15.1)	1.0 (ref)	NA
BMI: Obese	20.7 (16.1,26.3)	1.7 (1.2,2.4)	1.6 (1.1,2.4)	11.3 (8.0,15.6)	2.1 (1.2,3.6)	NA
BMI: Overweight	15.8 (11.0,22.2)	1.3 (0.8,2.0)	1.1 (0.8,1.7)	5.2 (3.6,7.4)	1.0 (0.6,1.7)	NA
BMI: Not OW/OB	12.4 (9.4,16.1)	1.0 (ref)	1.0 (ref)	5.4 (3.5,8.1)	1.0 (ref)	NA
Smoke: Ever	18.4 (14.1,23.5)	1.3 (1.0,1.9)	1.3 (1.0,1.8)	7.8 (5.7,10.7)	1.3 (0.9,2.0)	NA
Smoke: Never	13.7 (11.0,16.9)	1.0 (ref)	1.0 (ref)	6.0 (4.5,7.9)	1.0 (ref)	NA
Healthcare coverage: Yes	15.8 (12.9,19.2)	1.0 (0.7,1.5)	1.0 (0.7,1.5)	6.2 (4.9,7.7)	0.7 (0.4,1.2)	NA
Healthcare coverage: No	15.9 (11.4,21.7)	1.0 (ref)	1.0 (ref)	8.9 (5.4,14.3)	1.0 (ref)	NA

Table 1.8. (Continued) United States, Native Hawaiian/Other Pacific Islander (NHOPI) men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	15.7 (12.6,19.4)	1.0 (0.7,1.4)	1.0 (0.7,1.5)	7.2 (5.7,9.1)	1.3 (0.7,2.2)	NA
Healthcare provider: No	15.5 (11.7,20.2)	1.0 (ref)	1.0 (ref)	5.6 (3.4,9.1)	1.0 (ref)	NA
Healthcare utilization: Yes	17.8 (14.0,22.3)	1.2 (0.8,1.8)	1.2 (0.8,1.8)	8.3 (6.3,10.9)	1.5 (0.9,2.6)	NA
Healthcare utilization: No	15.2 (10.5,21.6)	1.0 (ref)	1.0 (ref)	5.5 (3.4,9.0)	1.0 (ref)	NA

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and any significant interactions between a covariate and region. Models for associations with healthcare utilization were run only for 2005-2010 data due to missing in the earlier time period.

Table 1.9. United States, Asian women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Asian Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	13.4 (12.6,14.2)	1.9 (1.6,2.3)	1.7 (1.4,2.1)	7.5 (6.9,8.2)	2.1 (1.7,2.7)	2.0 (1.6,2.6)
Region: West	9.7 (8.5,11.0)	1.4 (1.1,1.7)	1.4 (1.1,1.8)	5.0 (4.2,5.9)	1.4 (1.1,1.9)	1.5 (1.1,1.9)
Region: Midwest	7.9 (6.6,9.5)	1.1 (0.9,1.5)	1.1 (0.9,1.4)	5.1 (4.0,6.5)	1.4 (1.0,2.0)	1.4 (1.0,2.0)
Region: Northeast	7.3 (6.3,8.5)	1.0 (0.8,1.3)	1.0 (0.8,1.3)	4.4 (3.5,5.4)	1.2 (0.9,1.7)	1.2 (0.9,1.7)
Region: South	7.0 (5.9,8.3)	1.0 (ref)	1.0 (ref)	3.6 (2.8,4.5)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	9.1 (8.2,10.1)	1.2 (1.0,1.4)	1.1 (0.9,1.4)	5.0 (4.4,5.8)	1.2 (0.9,1.5)	1.1 (0.8,1.4)
Time period: 2005-2007	9.1 (8.1,10.3)	1.2 (0.9,1.4)	1.1 (0.9,1.4)	5.0 (4.2,5.9)	1.2 (0.9,1.5)	1.1 (0.8,1.4)
Time period: 2001-2003	7.9 (6.7,9.3)	1.0 (ref)	1.0 (ref)	4.2 (3.4,5.2)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	8.8 (7.7,10.1)	1.0 (0.8,1.3)	1.4 (1.0,1.8)	4.1 (3.4,4.9)	0.7 (0.5,1.0)	0.9 (0.6,1.2)
Age: 35-64 years	8.8 (8.0,9.6)	1.0 (0.8,1.3)	1.2 (0.9,1.5)	5.1 (4.5,5.8)	0.9 (0.7,1.2)	0.9 (0.7,1.2)
Age: >=65 years	8.7 (6.9,10.8)	1.0 (ref)	1.0 (ref)	5.7 (4.3,7.6)	1.0 (ref)	1.0 (ref)
BMI: Obese	14.7 (12.4,17.5)	1.9 (1.5,2.3)	1.8 (1.5,2.2)	10.0 (8.2,12.3)	2.6 (2.0,3.3)	2.5 (2.0,3.2)
BMI: Overweight	10.6 (9.1,12.4)	1.3 (1.1,1.6)	1.3 (1.1,1.6)	6.7 (5.6,8.1)	1.7 (1.4,2.2)	1.7 (1.3,2.1)
BMI: Not OW/OB	7.9 (7.2,8.7)	1.0 (ref)	1.0 (ref)	3.9 (3.4,4.4)	1.0 (ref)	1.0 (ref)
Smoke: Ever	12.8 (11.1,14.7)	1.6 (1.3,1.9)	1.5 (1.2,1.8)	5.9 (5.0,7.0)	1.3 (1.1,1.6)	1.2 (0.9,1.4)
Smoke: Never	8.1 (7.4,8.8)	1.0 (ref)	1.0 (ref)	4.6 (4.1,5.1)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	9.2 (8.5,9.9)	1.6 (1.2,2.2)	1.3 (0.9,1.8)	5.0 (4.6,5.6)	1.7 (1.2,2.5)	1.3 (0.8,1.9)
Healthcare coverage: No	5.8 (4.3,7.8)	1.0 (ref)	1.0 (ref)	3.0 (2.0,4.3)	1.0 (ref)	1.0 (ref)

Table 1.9. (Continued) United States, Asian women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Asian Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	9.4 (8.7,10.2)	1.6 (1.3,2.0)	1.5 (1.2,1.9)	5.3 (4.8,5.8)	2.0 (1.5,2.7)	1.7 (1.3,2.2)
Healthcare provider: No	5.9 (4.8,7.4)	1.0 (ref)	1.0 (ref)	2.7 (2.0,3.6)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	9.2 (8.4,10.0)	1.1 (0.8,1.4)	1.0 (0.7,1.3)	5.1 (4.6,5.8)	1.2 (0.8,1.7)	0.9 (0.6,1.3)
Healthcare utilization: No	8.6 (6.6,11.1)	1.0 (ref)	1.0 (ref)	4.3 (3.1,6.0)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and any significant interactions between a covariate and region. Models for associations with healthcare utilization were run only for 2005-2010 data due to missing in the earlier time period.

Table 1.10. United States, Asian men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Asian Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	13.2 (12.2,14.2)	1.9 (1.5,2.4)	1.9 (1.5,2.4)	5.6 (5.0,6.4)	2.0 (1.4,2.7)	1.9 (1.4,2.5)
Region: West	8.8 (7.5,10.3)	1.3 (1.0,1.7)	1.3 (1.0,1.7)	3.8 (3.0,4.9)	1.3 (0.9,1.9)	1.4 (0.9,1.9)
Region: Midwest	8.0 (6.4,9.9)	1.2 (0.8,1.6)	1.1 (0.8,1.5)	3.6 (2.7,4.9)	1.3 (0.8,1.9)	1.2 (0.8,1.8)
Region: Northeast	6.9 (5.9,8.2)	1.0 (0.8,1.3)	1.0 (0.8,1.4)	4.0 (3.2,5.0)	1.4 (1.0,2.0)	1.4 (1.0,2.0)
Region: South	6.9 (5.5,8.7)	1.0 (ref)	1.0 (ref)	2.9 (2.2,3.8)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	9.2 (8.0,10.5)	1.4 (1.1,1.7)	1.4 (1.1,1.8)	4.3 (3.6,5.0)	1.3 (0.9,1.8)	1.2 (0.8,1.7)
Time period: 2005-2007	7.9 (6.9,9.2)	1.2 (0.9,1.5)	1.2 (0.9,1.6)	3.4 (2.7,4.2)	1.0 (0.7,1.4)	1.0 (0.7,1.4)
Time period: 2001-2003	6.7 (5.6,8.1)	1.0 (ref)	1.0 (ref)	3.4 (2.5,4.5)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	10.0 (8.7,11.5)	1.1 (0.8,1.5)	1.3 (1.0,1.8)	3.9 (3.1,4.8)	0.7 (0.5,1.1)	0.8 (0.6,1.2)
Age: 35-64 years	6.4 (5.7,7.2)	0.7 (0.5,1.0)	0.8 (0.6,1.1)	3.4 (2.9,4.0)	0.6 (0.4,0.9)	0.7 (0.5,0.9)
Age: >=65 years	9.0 (6.8,11.8)	1.0 (ref)	1.0 (ref)	5.3 (3.9,7.2)	1.0 (ref)	1.0 (ref)
BMI: Obese	15.3 (12.1,19.2)	2.1 (1.6,2.7)	2.0 (1.5,2.6)	7.7 (5.5,10.6)	2.3 (1.6,3.3)	2.2 (1.5,3.3)
BMI: Overweight	8.0 (6.9,9.1)	1.1 (0.9,1.3)	1.1 (0.9,1.3)	3.5 (2.9,4.3)	1.1 (0.8,1.4)	1.0 (0.8,1.3)
BMI: Not OW/OB	7.3 (6.4,8.3)	1.0 (ref)	1.0 (ref)	3.4 (2.8,4.0)	1.0 (ref)	1.0 (ref)
Smoke: Ever	7.4 (6.4,8.6)	0.9 (0.7,1.1)	0.9 (0.7,1.1)	3.3 (2.7,4.1)	0.8 (0.6,1.1)	0.8 (0.6,1.1)
Smoke: Never	8.5 (7.6,9.4)	1.0 (ref)	1.0 (ref)	4.0 (3.4,4.6)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	8.3 (7.5,9.0)	1.2 (0.9,1.7)	1.1 (0.8,1.6)	4.0 (3.5,4.5)	1.7 (1.1,2.5)	1.5 (1.0,2.4)
Healthcare coverage: No	6.8 (4.9,9.2)	1.0 (ref)	1.0 (ref)	2.3 (1.6,3.4)	1.0 (ref)	1.0 (ref)

Table 1.10. (Continued) United States, Asian men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Asian Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	8.6 (7.8,9.5)	1.3 (1.0,1.7)	1.3 (1.0,1.7)	4.1 (3.6,4.7)	1.5 (1.1,2.1)	1.3 (0.9,1.9)
Healthcare provider: No	6.6 (5.3,8.1)	1.0 (ref)	1.0 (ref)	2.7 (2.0,3.6)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	8.5 (7.6,9.4)	0.9 (0.7,1.2)	1.0 (0.7,1.3)	4.0 (3.4,4.6)	1.1 (0.8,1.7)	1.2 (0.8,1.8)
Healthcare utilization: No	9.2 (7.2,11.9)	1.0 (ref)	1.0 (ref)	3.5 (2.5,4.8)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and any significant interactions between a covariate and region. Models for associations with healthcare utilization were run only for 2005-2010 data due to missing in the earlier time period.

Table 1.11. United States, White women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	17.1 (16.2,18.1)	1.3 (1.2,1.4)	1.3 (1.2,1.4)	11.2 (10.5,12.1)	1.2 (1.1,1.3)	1.2 (1.1,1.3)
Region: West	15.2 (14.9,15.5)	1.1 (1.1,1.2)	1.2 (1.1,1.2)	10.1 (9.9,10.3)	1.1 (1.1,1.1)	1.1 (1.1,1.2)
Region: Midwest	13.7 (13.5,13.9)	1.0 (1.0,1.0)	1.0 (1.0,1.0)	9.9 (9.7,10.1)	1.1 (1.0,1.1)	1.0 (1.0,1.1)
Region: Northeast	14.6 (14.3,14.8)	1.1 (1.1,1.1)	1.1 (1.1,1.1)	10.5 (10.3,10.7)	1.1 (1.1,1.2)	1.1 (1.1,1.2)
Region: South	13.4 (13.3,13.6)	1.0 (ref)	1.0 (ref)	9.3 (9.2,9.5)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	14.9 (14.7,15.0)	1.1 (1.1,1.2)	1.1 (1.0,1.1)	10.4 (10.2,10.5)	1.1 (1.1,1.2)	1.0 (1.0,1.1)
Time period: 2005-2007	14.4 (14.2,14.6)	1.1 (1.1,1.1)	1.0 (1.0,1.1)	10.1 (9.9,10.2)	1.1 (1.1,1.1)	1.0 (1.0,1.0)
Time period: 2001-2003	13.0 (12.8,13.2)	1.0 (ref)	1.0 (ref)	9.1 (9.0,9.3)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	16.2 (15.9,16.4)	1.4 (1.4,1.4)	1.5 (1.5,1.6)	10.6 (10.3,10.8)	1.3 (1.2,1.3)	1.4 (1.4,1.4)
Age: 35-64 years	14.2 (14.0,14.3)	1.2 (1.2,1.3)	1.2 (1.2,1.2)	10.2 (10.0,10.3)	1.2 (1.2,1.2)	1.2 (1.2,1.2)
Age: >=65 years	11.5 (11.3,11.7)	1.0 (ref)	1.0 (ref)	8.4 (8.2,8.5)	1.0 (ref)	1.0 (ref)
BMI: Obese	20.0 (19.7,20.2)	1.7 (1.6,1.7)	1.7 (1.6,1.7)	15.1 (14.8,15.3)	1.9 (1.8,1.9)	1.9 (1.8,1.9)
BMI: Overweight	13.8 (13.6,14.0)	1.1 (1.1,1.2)	1.2 (1.1,1.2)	9.6 (9.4,9.8)	1.2 (1.2,1.2)	1.2 (1.2,1.2)
BMI: Not OW/OB	12.1 (11.9,12.2)	1.0 (ref)	1.0 (ref)	8.0 (7.9,8.1)	1.0 (ref)	1.0 (ref)
Smoke: Ever	16.2 (16.0,16.4)	1.3 (1.3,1.3)	1.3 (1.3,1.3)	11.6 (11.5,11.8)	1.4 (1.3,1.4)	1.3 (1.3,1.4)
Smoke: Never	12.6 (12.5,12.8)	1.0 (ref)	1.0 (ref)	8.6 (8.5,8.7)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	14.1 (14.0,14.2)	1.0 (1.0,1.0)	1.0 (1.0,1.0)	9.9 (9.8,10.0)	1.0 (1.0,1.1)	1.0 (1.0,1.0)
Healthcare coverage: No	14.4 (14.0,14.7)	1.0 (ref)	1.0 (ref)	9.6 (9.4,9.9)	1.0 (ref)	1.0 (ref)

Table 1.11. (Continued) United States, White women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	14.4 (14.3,14.6)	1.2 (1.2,1.2)	1.3 (1.2,1.3)	10.2 (10.1,10.3)	1.4 (1.3,1.4)	1.4 (1.4,1.5)
Healthcare provider: No	12.0 (11.7,12.4)	1.0 (ref)	1.0 (ref)	7.4 (7.2,7.7)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	14.7 (14.6,14.8)	1.0 (1.0,1.1)	1.0 (1.0,1.1)	10.3 (10.2,10.5)	1.1 (1.0,1.1)	1.0 (1.0,1.1)
Healthcare utilization: No	14.2 (13.9,14.6)	1.0 (ref)	1.0 (ref)	9.5 (9.2,9.8)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and any significant interactions between a covariate and region. Models for associations with healthcare utilization were run only for 2005-2010 data due to missing in the earlier time period.

Table 1.12. United States, White men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	11.2 (10.3,12.1)	1.1 (1.0,1.2)	1.1 (1.0,1.2)	5.3 (4.7,5.9)	1.0 (0.8,1.1)	1.0 (0.9,1.1)
Region: West	11.6 (11.3,12.0)	1.1 (1.1,1.2)	1.2 (1.1,1.2)	6.3 (6.0,6.5)	1.1 (1.1,1.2)	1.2 (1.1,1.2)
Region: Midwest	10.4 (10.1,10.6)	1.0 (1.0,1.0)	1.0 (1.0,1.0)	6.2 (6.0,6.4)	1.1 (1.1,1.2)	1.1 (1.1,1.2)
Region: Northeast	11.0 (10.7,11.2)	1.1 (1.0,1.1)	1.1 (1.0,1.1)	6.6 (6.4,6.8)	1.2 (1.1,1.2)	1.2 (1.1,1.2)
Region: South	10.3 (10.1,10.5)	1.0 (ref)	1.0 (ref)	5.5 (5.3,5.6)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	11.5 (11.3,11.7)	1.2 (1.2,1.2)	1.2 (1.1,1.2)	6.5 (6.3,6.6)	1.2 (1.1,1.2)	1.1 (1.1,1.2)
Time period: 2005-2007	10.9 (10.7,11.1)	1.1 (1.1,1.2)	1.1 (1.1,1.1)	6.1 (5.9,6.2)	1.1 (1.0,1.1)	1.1 (1.0,1.1)
Time period: 2001-2003	9.7 (9.5,10.0)	1.0 (ref)	1.0 (ref)	5.6 (5.4,5.7)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	13.9 (13.6,14.2)	1.6 (1.5,1.6)	1.8 (1.7,1.8)	6.9 (6.7,7.1)	1.2 (1.1,1.2)	1.4 (1.3,1.4)
Age: 35-64 years	9.7 (9.5,9.8)	1.1 (1.1,1.1)	1.1 (1.1,1.2)	5.6 (5.5,5.7)	1.0 (0.9,1.0)	1.0 (1.0,1.0)
Age: >=65 years	8.7 (8.5,8.9)	1.0 (ref)	1.0 (ref)	5.9 (5.8,6.1)	1.0 (ref)	1.0 (ref)
BMI: Obese	12.8 (12.6,13.1)	1.2 (1.2,1.2)	1.2 (1.2,1.3)	7.6 (7.4,7.9)	1.3 (1.3,1.4)	1.3 (1.2,1.4)
BMI: Overweight	9.7 (9.6,9.9)	0.9 (0.9,0.9)	0.9 (0.9,1.0)	5.3 (5.2,5.5)	0.9 (0.9,1.0)	0.9 (0.9,1.0)
BMI: Not OW/OB	10.6 (10.4,10.8)	1.0 (ref)	1.0 (ref)	5.8 (5.7,6.0)	1.0 (ref)	1.0 (ref)
Smoke: Ever	11.0 (10.9,11.2)	1.1 (1.0,1.1)	1.1 (1.1,1.2)	6.4 (6.3,6.5)	1.1 (1.1,1.2)	1.2 (1.1,1.2)
Smoke: Never	10.4 (10.3,10.6)	1.0 (ref)	1.0 (ref)	5.7 (5.5,5.8)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	10.6 (10.5,10.8)	0.9 (0.9,1.0)	1.0 (0.9,1.0)	6.1 (6.0,6.2)	1.0 (1.0,1.1)	0.9 (0.9,1.0)
Healthcare coverage: No	11.2 (10.8,11.6)	1.0 (ref)	1.0 (ref)	5.8 (5.5,6.1)	1.0 (ref)	1.0 (ref)

Table 1.12. (Continued) United States, White men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	11.1 (11.0,11.3)	1.2 (1.1,1.2)	1.4 (1.3,1.4)	6.5 (6.4,6.6)	1.5 (1.4,1.6)	1.6 (1.6,1.7)
Healthcare provider: No	9.4 (9.2,9.7)	1.0 (ref)	1.0 (ref)	4.4 (4.2,4.6)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	11.4 (11.2,11.5)	1.1 (1.0,1.1)	1.1 (1.0,1.1)	6.6 (6.4,6.7)	1.3 (1.2,1.3)	1.2 (1.1,1.2)
Healthcare utilization: No	10.6 (10.3,10.9)	1.0 (ref)	1.0 (ref)	5.2 (5.0,5.4)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and any significant interactions between a covariate and region. Models for associations with healthcare utilization were run only for 2005-2010 data due to missing in the earlier time period.

Table 1.13. United States, Other race women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Other Race Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	18.3 (16.0,20.9)	1.4 (1.2,1.5)	1.4 (1.2,1.6)	11.9 (10.0,14.0)	1.3 (1.1,1.5)	1.2 (1.0,1.5)
Region: West	17.4 (16.5,18.3)	1.3 (1.2,1.4)	1.3 (1.2,1.4)	12.1 (11.3,12.9)	1.3 (1.2,1.4)	1.3 (1.2,1.4)
Region: Midwest	17.6 (17.0,18.3)	1.3 (1.2,1.4)	1.2 (1.2,1.3)	13.3 (12.7,13.9)	1.4 (1.3,1.5)	1.3 (1.3,1.4)
Region: Northeast	18.4 (17.7,19.2)	1.4 (1.3,1.4)	1.3 (1.3,1.4)	13.2 (12.6,13.8)	1.4 (1.3,1.5)	1.4 (1.3,1.4)
Region: South	13.5 (13.2,13.8)	1.0 (ref)	1.0 (ref)	9.4 (9.2,9.7)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	16.8 (16.4,17.3)	1.2 (1.1,1.2)	1.1 (1.0,1.1)	12.0 (11.6,12.4)	1.1 (1.1,1.2)	1.0 (1.0,1.1)
Time period: 2005-2007	15.6 (15.1,16.1)	1.1 (1.0,1.1)	1.0 (1.0,1.1)	11.0 (10.6,11.4)	1.1 (1.0,1.1)	1.0 (0.9,1.1)
Time period: 2001-2003	14.5 (14.0,15.0)	1.0 (ref)	1.0 (ref)	10.4 (10.0,10.9)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	15.7 (15.2,16.2)	1.1 (1.1,1.2)	1.4 (1.3,1.5)	10.7 (10.2,11.1)	1.1 (1.0,1.2)	1.4 (1.3,1.4)
Age: 35-64 years	16.2 (15.8,16.6)	1.2 (1.1,1.2)	1.2 (1.1,1.3)	11.9 (11.6,12.2)	1.2 (1.1,1.3)	1.2 (1.2,1.3)
Age: >=65 years	13.8 (13.2,14.5)	1.0 (ref)	1.0 (ref)	9.8 (9.3,10.3)	1.0 (ref)	1.0 (ref)
BMI: Obese	20.7 (20.2,21.2)	1.6 (1.5,1.6)	1.6 (1.5,1.6)	15.7 (15.2,16.1)	1.8 (1.7,1.8)	1.7 (1.6,1.8)
BMI: Overweight	14.6 (14.1,15.2)	1.1 (1.1,1.2)	1.1 (1.1,1.2)	10.1 (9.6,10.5)	1.1 (1.1,1.2)	1.1 (1.1,1.2)
BMI: Not OW/OB	13.1 (12.7,13.6)	1.0 (ref)	1.0 (ref)	8.9 (8.6,9.3)	1.0 (ref)	1.0 (ref)
Smoke: Ever	19.7 (19.2,20.2)	1.4 (1.4,1.5)	1.4 (1.3,1.4)	14.6 (14.2,15.1)	1.5 (1.5,1.6)	1.5 (1.4,1.5)
Smoke: Never	13.8 (13.5,14.1)	1.0 (ref)	1.0 (ref)	9.5 (9.3,9.8)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	16.6 (16.3,16.9)	1.3 (1.3,1.4)	1.2 (1.1,1.2)	11.9 (11.6,12.2)	1.4 (1.3,1.5)	1.2 (1.1,1.3)
Healthcare coverage: No	12.6 (12.1,13.2)	1.0 (ref)	1.0 (ref)	8.6 (8.2,9.1)	1.0 (ref)	1.0 (ref)

Table 1.13. (Continued) United States, Other race women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Other Race Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	16.6 (16.3,16.9)	1.4 (1.3,1.5)	1.2 (1.2,1.3)	12.0 (11.8,12.3)	1.5 (1.4,1.6)	1.3 (1.2,1.4)
Healthcare provider: No	12.0 (11.5,12.7)	1.0 (ref)	1.0 (ref)	7.8 (7.3,8.3)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	16.4 (16.1,16.7)	1.1 (1.0,1.2)	1.0 (0.9,1.1)	11.8 (11.5,12.1)	1.3 (1.2,1.4)	1.1 (1.0,1.2)
Healthcare utilization: No	14.6 (13.6,15.7)	1.0 (ref)	1.0 (ref)	9.3 (8.5,10.2)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and any significant interactions between a covariate and region. Models for associations with healthcare utilization were run only for 2005-2010 data due to missing in the earlier time period.

Table 1.14. United States, Other race men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Other Race Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	11.6 (9.5,14.1)	1.1 (0.9,1.3)	1.0 (0.8,1.3)	5.0 (3.6,6.7)	0.9 (0.6,1.2)	0.9 (0.6,1.2)
Region: West	11.0 (10.1,11.9)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	5.9 (5.3,6.6)	1.0 (0.9,1.2)	1.1 (0.9,1.2)
Region: Midwest	13.7 (13.0,14.6)	1.3 (1.2,1.4)	1.3 (1.2,1.4)	8.1 (7.5,8.7)	1.4 (1.3,1.6)	1.4 (1.2,1.5)
Region: Northeast	12.0 (11.3,12.8)	1.1 (1.1,1.2)	1.1 (1.0,1.2)	6.8 (6.2,7.4)	1.2 (1.1,1.3)	1.2 (1.1,1.3)
Region: South	10.5 (10.1,11.0)	1.0 (ref)	1.0 (ref)	5.7 (5.4,6.0)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	12.4 (11.8,13.0)	1.1 (1.1,1.2)	1.1 (1.1,1.2)	6.9 (6.5,7.4)	1.2 (1.1,1.3)	1.2 (1.0,1.3)
Time period: 2005-2007	10.8 (10.3,11.4)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	6.0 (5.6,6.4)	1.0 (0.9,1.1)	1.0 (0.9,1.1)
Time period: 2001-2003	10.8 (10.2,11.4)	1.0 (ref)	1.0 (ref)	5.9 (5.5,6.3)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	13.8 (13.2,14.5)	1.5 (1.4,1.6)	1.8 (1.6,2.0)	6.9 (6.5,7.4)	1.1 (1.0,1.2)	1.4 (1.2,1.6)
Age: 35-64 years	9.8 (9.4,10.2)	1.1 (1.0,1.2)	1.1 (1.0,1.2)	5.8 (5.5,6.1)	0.9 (0.8,1.0)	1.0 (0.9,1.1)
Age: >=65 years	9.3 (8.6,10.1)	1.0 (ref)	1.0 (ref)	6.2 (5.7,6.8)	1.0 (ref)	1.0 (ref)
BMI: Obese	13.2 (12.6,13.9)	1.1 (1.0,1.2)	1.1 (1.1,1.2)	7.8 (7.3,8.3)	1.2 (1.1,1.4)	1.2 (1.1,1.3)
BMI: Overweight	10.1 (9.6,10.6)	0.9 (0.8,0.9)	0.9 (0.8,1.0)	5.4 (5.0,5.8)	0.9 (0.8,0.9)	0.9 (0.8,1.0)
BMI: Not OW/OB	11.8 (11.2,12.4)	1.0 (ref)	1.0 (ref)	6.3 (5.9,6.7)	1.0 (ref)	1.0 (ref)
Smoke: Ever	11.9 (11.4,12.4)	1.1 (1.0,1.2)	1.2 (1.1,1.3)	6.8 (6.4,7.1)	1.1 (1.1,1.2)	1.2 (1.1,1.3)
Smoke: Never	10.9 (10.5,11.4)	1.0 (ref)	1.0 (ref)	5.9 (5.6,6.3)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	11.7 (11.4,12.1)	1.1 (1.0,1.2)	1.1 (1.0,1.1)	6.6 (6.3,6.8)	1.2 (1.1,1.3)	1.0 (0.9,1.1)
Healthcare coverage: No	10.4 (9.8,11.1)	1.0 (ref)	1.0 (ref)	5.7 (5.2,6.2)	1.0 (ref)	1.0 (ref)

Table 1.14. (Continued) United States, Other race men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Other Race Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	12.2 (11.9,12.6)	1.3 (1.2,1.3)	1.3 (1.2,1.5)	7.2 (6.9,7.5)	1.6 (1.4,1.7)	1.7 (1.5,1.8)
Healthcare provider: No	9.8 (9.2,10.4)	1.0 (ref)	1.0 (ref)	4.6 (4.2,5.0)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	12.0 (11.6,12.5)	1.2 (1.1,1.3)	1.1 (1.0,1.3)	6.9 (6.6,7.3)	1.4 (1.3,1.6)	1.3 (1.1,1.5)
Healthcare utilization: No	10.2 (9.3,11.1)	1.0 (ref)	1.0 (ref)	4.8 (4.3,5.5)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and any significant interactions between a covariate and region. Models for associations with healthcare utilization were run only for 2005-2010 data due to missing in the earlier time period.

DISCUSSION

This study provides nationwide baseline estimates of asthma prevalence among NHOPI in the US during the decade between 2001 and 2010. These estimates demonstrate that asthma prevalence has been greatly elevated among NHOPI women and men compared to Asians. Moreover, asthma ever-diagnoses were not only more prevalent among NHOPI compared to Asians but were also more common for NHOPI than for Whites or those of Other race. This work is consistent with previous findings that asthma prevalence has been higher overall among NHOPI (54, 77). In addition, by demonstrating numerous differences of substantial magnitude between Asian and NHOPI sociodemographics and asthma prevalence estimates, this work demonstrates the importance of disaggregating NHOPI and Asian subpopulations in health studies (77, 78).

This investigation also found that the strengths of associations with various sociodemographic asthma risk factors has varied by race, after controlling for the other covariates. That is, associations with asthma for each of several known sociodemographic risk factors (i.e., region, time period, age, BMI, smoking, healthcare coverage, and healthcare provider) are different amongst racial groupings, as well as by sex. These findings of sex/race modifications to associations with asthma prevalence calls for the inclusion of such interactions when controlling for the effects sociodemographic differences across racial groupings.

Consistent with other US cross-sectional investigations, univariate associations with lifetime and current asthma prevalence were observed for the factors of female sex, age younger than 65 years, obesity, and smoking (8, 18, 25, 29, 49). Also in agreement with other studies, asthma prevalence as measured by these BRFSS data had increased with time (8, 25). Some of these congruent previous findings made use of other US health surveys such as the National Health Interview Survey (8, 25, 29), the National Health and Nutrition Examination Survey (18), and the Hawai‘i Health Survey (54), which lends validity to the BRFSS data utilized by this investigation.

Also consistent with many other studies, strong associations with elevated asthma prevalence were observed for female sex. Many mechanisms may be involved in the well-documented differences in asthma prevalence and severity between women and men (15), including findings that women more frequently possess health insurance and access medical care than do men (79, 80). However, this study also found that female sex was not a predictor of lifetime asthma for all races: Uniquely, Asian women reported lifetime asthma more often than men in only one sociodemographic category, ever-smoking. These findings contribute observations that elevated asthma prevalence among women compared to men varied by race in

the US. Thus, better understanding is needed regarding race-specific asthma risk factors among women.

This study found that obesity was universally associated with asthma regardless of sex/race. Furthermore, adjusted asthma prevalence was much higher for obese women compared to obese men of the same race, except among Asians and NHOPI. However, Asian women reporting overweight BMI had higher adjusted current asthma than overweight Asian men. These findings are consistent with other studies that have suggested an important and gender-mediated relationship between elevated BMI and asthma sequelae (21, 81).

A key finding of this investigation is excess asthma in the US state of Hawai‘i, especially among White women and all Asians. Small sample sizes limited inferences for NHOPI, but asthma prevalence was somewhat more elevated for NHOPI living in Hawai‘i than in the Southern or Northeastern US.

Besides modest sample sizes in some strata, this study has other limitations. The self-reported nature of BRFSS survey data could result in response and information bias. However, self-reported measures in BRFSS have demonstrated high reliability and validity (82). Moreover, self-reported lifetime asthma has demonstrated good positive predictive value and specificity, but lower sensitivity (83-85). Thus, bias in self-reported asthma is likely toward undercounting those in the population who truly have asthma, which is the desired bias direction in studies examining asthma correlates. Another limitation of this study is possible information bias from race misclassification. However, if racial misclassification in this study was non-differential, bias would likely be towards the null. Lastly, another limitation of this study is the lack of a covariate for SES, which is an important and likely effect modifier and/or confounder. Similarly, other covariates important for predicting asthma and likely also highly correlated with the chosen dependent variables, were not available for inclusion in this study. For example, better measures of aspects of healthcare access, usage, and quality could potentially alter the adjusted magnitudes of associations with asthma described herein.

STUDY 2: ASTHMA PREVALENCE DISPARITIES AND DIFFERENCES IN SOCIODEMOGRAPHIC ASSOCIATIONS WITH ASTHMA AMONG NATIVE HAWAIIAN/OTHER PACIFIC ISLANDER, ASIAN, AND WHITE RACE IN HAWAIʻI

INTRODUCTION

It has been previously noted that asthma prevalence is relatively high in the state of Hawaiʻi (86, 87), and that NHOPI in the US bear a disproportionate burden of asthma compared to other racial groups (53, 54). In study 1 above, elevated asthma prevalence in Hawaiʻi compared to some other US regions was observed to persist within some sex/race groups after multivariable adjustment for the potential sociodemographic confounders of geographic region, time period, age, BMI, smoking, healthcare coverage, and healthcare provider, plus any significant interactions between these covariates and region. Moreover, study 1 confirmed that asthma prevalence has been relatively high among NHOPI during the decade between 2001-2010, with some racial differences in sociodemographic associations with asthma.

The US state of Hawaiʻi is very racially diverse, with an ethnocultural history and demographic composition that is unique in the US (55), due in part to its unique geographical position in the Pacific. Hawaiʻi is also distinct in having the largest percentages in the nation of NHOPI (56) and those identifying as Asian (88). Despite these unique sociodemographic characteristics, the asthma epidemic in Hawai'i has received very little investigative attention.

This second study investigated the racial and sociodemographic factors involved in the adult asthma epidemic specifically in Hawaiʻi, with intent to address asthma knowledge gaps regarding NHOPI and the distinctive multi-ethnic population of Hawaiʻi. The first aim was to determine asthma sociodemographic associations present in Hawaiʻi, and then to compare the burden of asthma among the predominant racial groups of Hawaiʻi, including NHOPI. The second objective was to compare across races the associations between asthma and sociodemographic factors, after multivariable adjustment for potential confounders. The final study aim was to assess whether asthma prevalence, racial disparities, and/or associations among sex/race groupings differ between Hawaiʻi versus the continental US population.

To my knowledge, this is the first investigation to provide an in-depth characterization of asthma specific to Hawaiʻi and to NHOPI in Hawaiʻi, using multivariable-adjusted estimates within sex/race subgroups.

METHODS

The data source, outcome variables, independent covariates, and statistical analyses were the same as for study 1, except that data included survey responses only from the US state of Hawai‘i. Adjusted current asthma prevalence among NHOPI men, as well as adjusted lifetime and current asthma among Other race women and men, could not be reliably estimated due to insufficient sample sizes in some strata from Hawai‘i.

RESULTS

Racial and Sociodemographic Diversity in Hawai‘i

There was a total of 54,103 BRFSS records from the state of Hawai‘i, surveyed from 2001 through 2010 (Table 2.2). The racial demography of Hawai‘i was markedly different than that observed in study 1 for the continental US population (Table 2.1); only 6.2% of the weighted adult population in Hawai‘i did not best identify as either NHOPI (13.8%), Asian (46.0%), or White (34.0%). Sample sizes for Black/African American or American Indian/Alaska Native in Hawai‘i were too small for stratified or multivariable analyses and so were grouped within Other race (Appendix Table 5.6). Of those classified as Other race from Hawai‘i, 23.8% identified as Black/African American and 7.1% as American Indian/Alaska Native; the racial makeup of the Other race category in Hawai‘i was markedly different than in the continental US population (Table 2.1, and Appendix Tables 5.1 and 5.6).

Table 2.1. Racial demographic and asthma prevalence differences between the weighted population of all US states versus the US state of Hawai'i alone - Behavioral Risk Factor Surveillance System data, 2001-2010.

		Lifetime asthma		Current asthma	
United States (including Hawai'i)	**Population characteristics, % (95%CI)**	**Prevalence, P% (95%CI)**	**Prevalence ratio, PR (95%CI)**	**Prevalence, P% (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	0.5 (0.5,0.5)	16.5 (14.8,18.4)	2.0 (1.7,2.2)	8.7 (7.7,9.9)	2.1 (1.8,2.4)
Race: White	78.2 (78.1,78.3)	12.5 (12.4,12.6)	1.5 (1.4,1.6)	8.0 (8.0,8.1)	1.9 (1.8,2.1)
Race: Other (58% Black/African American; 9.5% American Indian/Alaska Native)	18.2 (18.1,18.3)	13.6 (13.4,13.8)	1.6 (1.5,1.7)	8.8 (8.6,8.9)	2.1 (1.9,2.3)
Race: Asian	3.2 (3.1,3.2)	8.4 (7.9,8.9)	1.0 (ref)	4.2 (3.9,4.5)	1.0 (ref)
Hawai'i	**Population characteristics, % (95%CI)**	**Prevalence, P% (95%CI)**	**Prevalence ratio, PR (95%CI)**	**Prevalence, P% (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	13.8 (13.4,14.3)	20.9 (19.5,22.4)	1.6 (1.4,1.7)	12.2 (11.1,13.3)	1.8 (1.6,2.1)
Race: White	34.0 (33.5,34.5)	14.0 (13.4,14.7)	1.1 (1.0,1.1)	8.1 (7.6,8.6)	1.2 (1.1,1.3)
Race: Other (23.8% Black/African American; 7.1% American Indian/Alaska Native)	6.2 (5.9,6.5)	14.7 (13.1,16.5)	1.1 (1.0,1.3)	8.2 (7.0,9.5)	1.2 (1.0,1.5)
Race: Asian	46.0 (45.4,46.6)	13.3 (12.7,13.9)	1.0 (ref)	6.6 (6.2,7.1)	1.0 (ref)

Table 2.2. Hawai'i – Sample sizes, weighted population characteristics, crude asthma prevalence, and unadjusted sociodemographic associations with asthma - Behavioral Risk Factor Surveillance System data, 2001-2010.

Hawai'i			Lifetime asthma		Current asthma	
	Sample size	Population characteristics, % (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)
Total	54,103	100.0	14.7 (14.3,15.1)		8.0 (7.7,83)	
Sex: Female	31,658	50.3 (49.7,50.9)	16.3 (15.7,16.9)	1.2 (1.2,1.3)	10.2 (9.7,10.6)	1.7 (1.6,1.9)
Sex: Male	22,445	49.7 (49.1,50.3)	13.1 (12.4,13.7)	1.0 (ref)	5.8 (5.4,6.3)	1.0 (ref)
Race: NHOPI	6,675	13.8 (13.4,14.3)	20.9 (19.5,22.4)	1.6 (1.4,1.7)	12.2 (11.1,13.3)	1.8 (1.6,2.1)
Race: White	22,936	34.0 (33.5,34.5)	14.0 (13.4,14.7)	1.1 (1.0,1.1)	8.1 (7.6,8.6)	1.2 (1.1,1.3)
Race: Other	3,133	6.2 (5.9,6.5)	14.7 (13.1,16.5)	1.1 (1.0,1.3)	8.2 (7.0,9.5)	1.2 (1.0,1.5)
Race: Asian	21,359	46.0 (45.4,46.6)	13.3 (12.7,13.9)	1.0 (ref)	6.6 (6.2,7.1)	1.0 (ref)
Time period: 2008-2010	19,681	34.4 (34.0,34.7)	16.9 (16.1,17.7)	1.4 (1.3,1.5)	9.5 (8.9,10.1)	1.4 (1.3,1.6)
Time period: 2005-2007	19,583	33.5 (33.2,33.8)	14.7 (13.9,15.4)	1.2 (1.1,1.3)	7.9 (7.3,8.4)	1.2 (1.1,1.3)
Time period: 2001-2003	14,839	32.1 (31.8,32.4)	12.4 (11.7,13.1)	1.0 (ref)	6.6 (6.1,7.2)	1.0 (ref)
Age: 18-34 years	9,288	30.1 (29.4,30.7)	18.3 (17.2,19.3)	1.9 (1.7,2.0)	9.2 (8.5,10.0)	1.6 (1.4,1.8)
Age: 35-64 years	31,131	51.6 (51.0,52.2)	14.4 (13.9,14.9)	1.5 (1.4,1.6)	8.1 (7.7,8.5)	1.4 (1.2,1.5)
Age: >=65 years	13,324	18.3 (17.9,18.7)	9.8 (9.2,10.5)	1.0 (ref)	5.9 (5.4,6.4)	1.0 (ref)
BMI: Obese	9,389	18.5 (18.0,19.0)	21.4 (20.2,22.6)	1.6 (1.5,1.8)	13.1 (12.1,14.0)	1.9 (1.7,2.1)
BMI: Overweight	15,969	30.6 (30.0,31.1)	13.3 (12.5,14.0)	1.0 (0.9,1.1)	6.9 (6.3,7.4)	1.0 (0.9,1.1)
BMI: Not OW/OB	27,714	50.9 (50.3,51.5)	13.1 (12.5,13.7)	1.0 (ref)	6.8 (6.4,7.3)	1.0 (ref)
Smoke: Ever	24,547	42.5 (41.9,43.1)	15.6 (15.0,16.3)	1.1 (1.1,1.2)	8.7 (8.3,9.3)	1.2 (1.1,1.3)
Smoke: Never	29,395	57.5 (56.9,58.1)	14.0 (13.4,14.5)	1.0 (ref)	7.4 (7.0,7.9)	1.0 (ref)

Table 2.2. (Continued) Hawai'i – Sample sizes, weighted population characteristics, crude asthma prevalence, and unadjusted sociodemographic associations with asthma - Behavioral Risk Factor Surveillance System data, 2001-2010.

Hawai'i			Lifetime asthma		Current asthma	
	Sample size	Population characteristics, % (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)
Healthcare coverage: Yes	50,315	92.6 (92.3,93.0)	14.6 (14.2,15.1)	0.9 (0.8,1.1)	8.0 (7.7,8.3)	1.0 (0.8,1.2)
Healthcare coverage: No	3,709	7.4 (7.0,7.7)	15.7 (13.9,17.7)	1.0 (ref)	8.2 (6.8,9.7)	1.0 (ref)
Healthcare provider: Yes	46,775	84.6 (84.1,85.1)	14.9 (14.4,15.4)	1.1 (1.0,1.2)	8.4 (8.0,8.7)	1.4 (1.2,1.6)
Healthcare provider: No	7,223	15.4 (14.9,15.9)	13.6 (12.4,14.8)	1.0 (ref)	6.0 (5.3,6.9)	1.0 (ref)
Healthcare utilization: Yes	31,294	79.7 (79.1,80.3)	15.5 (14.9,16.1)	0.9 (0.8,1.0)	9.0 (8.5,9.5)	1.2 (1.1,1.4)
Healthcare utilization: No	7,536	20.3 (19.7,20.9)	16.7 (15.4,18.1)	1.0 (ref)	7.4 (6.6,8.3)	1.0 (ref)
Healthcare utilization includes only 2005-2010 data due to missing in the earlier time period.						

There were many differences between racial groups in Hawai‘i in regard to sociodemographic characteristics of potential importance to asthma prevalence (Tables 2.3 and 2.4, and Appendix Tables 5.7 thru 5.10). Obesity was conspicuously prevalent in the NHOPI subpopulation, and NHOPI also reported younger age more frequently than Asians or Whites. Asians had the greatest proportions of age over 65 years, not overweight/obese BMI, and nonsmoking, whereas NHOPI and Whites had the highest frequencies of smoking. Those categorized as Other race reported age over 65 years least frequently.

Sociodemographic characteristics by race were different in Hawai‘i compared to the continental US (Tables 2.3 and 2.4 versus Tables 1.3 and 1.4). For example, NHOPI and Asians reported young age (18-34 years) more often in the US overall compared to in the US state of Hawai‘i, but reported obesity and smoking much more often in Hawai‘i. Healthcare coverage or having a healthcare provider was also more common among NHOPI and Asians who resided in Hawai‘i, likely due in part to the Hawai‘i Prepaid Health Care Act. However, among all racial groups recent utilization of healthcare was less frequent in Hawai‘i than in the continental US.

Table 2.3. Hawai'i, by Native Hawaiian/Other Pacific Islander (NHOPI) or Asian race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	NHOPI			Asian		
	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)
Total	6,675	1,063,319	100.0	21,359	7,064,421	100.0
Sex: Female	4,079	469,351	52.6 (50.8,54.3)	12,855	3,208,889	51.9 (51.0,52.9)
Sex: Male	2,596	593,968	47.4 (45.7,49.2)	8,504	3,855,533	48.1 (47.1,49.0)
Time period: 2008-2010	2,457	134,680	38.1 (36.4,39.8)	7,857	448,441	34.7 (34.0,35.4)
Time period: 2005-2007	2,470	466,988	33.4 (31.9,34.9)	7,556	2,722,176	33.3 (32.6,34.1)
Time period: 2001-2003	1,748	99,852	28.5 (27.1,30.0)	5,946	854,706	32.0 (31.3,32.7)
Age: 18-34 years	1,837	145,555	42.2 (40.4,44.0)	3,278	1,530,561	26.9 (26.0,27.9)
Age: 35-64 years	3,712	216,244	46.4 (44.7,48.1)	11,487	1,508,538	50.8 (49.9,51.8)
Age: >=65 years	1,101	358,542	11.4 (10.5,12.3)	6,440	2,717,117	22.3 (21.6,22.9)
BMI: Obese	2,474	371,011	40.1 (38.3,41.9)	2,476	2,259,790	12.3 (11.7,12.9)
BMI: Overweight	1,960	333,766	28.1 (26.6,29.7)	6,278	2,087,515	30.6 (29.7,31.4)
BMI: Not OW/OB	2,133	523,567	31.8 (30.2,33.4)	12,173	2,785,725	57.1 (56.2,58.1)
Smoke: Ever	3,394	466,054	48.2 (46.5,49.9)	7,900	3,600,117	36.3 (35.4,37.2)
Smoke: Never	3,263	68,736	51.8 (50.1,53.5)	13,403	610,020	63.7 (62.8,64.6)
Healthcare coverage: Yes	6,090	222,439	89.2 (87.9,90.4)	20,401	484,974	94.4 (93.9,94.8)
Healthcare coverage: No	569	325,863	10.8 (9.6,12.1)	922	1,843,411	5.6 (5.2,6.1)
Healthcare provider: Yes	5,759	479,911	82.4 (80.9,83.8)	19,415	4,460,926	89.1 (88.5,89.7)
Healthcare provider: No	900	421,193	17.6 (16.2,19.1)	1,898	1,741,114	10.9 (10.3,11.5)
Healthcare utilization: Yes	3,872	636,841	77.8 (75.9,79.6)	12,616	5,270,049	80.6 (79.6,81.5)
Healthcare utilization: No	1,008	855,242	22.2 (20.4,24.1)	2,600	6,151,076	19.4 (18.5,20.4)
Healthcare utilization includes only 2005-2010 data due to missing in the earlier time period.						

Table 2.4. Hawai'i, by White or Other race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	White			Other Race		
	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)
Total	22,936	174,291,992	100.0	3,133	40,563,792	100.0
Sex: Female	12,957	90,347,619	47.7 (46.8,48.6)	1,767	20,798,440	46.9 (44.5,49.2)
Sex: Male	9,979	83,944,374	52.3 (51.4,53.2)	1,366	19,765,352	53.1 (50.8,55.5)
Time period: 2008-2010	8,378	331,409	33.4 (32.7,34.1)	989	60,233	29.1 (27.0,31.2)
Time period: 2005-2007	8,339	39,842,376	33.3 (32.6,34.0)	1,218	6,389,102	36.3 (34.2,38.6)
Time period: 2001-2003	6,219	42,509,829	33.3 (32.6,34.0)	926	6,186,133	34.6 (32.4,36.9)
Age: 18-34 years	3,376	32,776,187	27.4 (26.5,28.4)	797	7,467,649	40.7 (38.3,43.2)
Age: 35-64 years	14,124	58,832,191	55.1 (54.2,56.0)	1,808	20,460,675	50.3 (47.9,52.7)
Age: >=65 years	5,335	60,147,908	17.4 (16.9,18.0)	448	13,925,426	9.0 (8.0,10.2)
BMI: Obese	3,809	57,836,274	17.3 (16.6,18.0)	630	14,114,768	23.1 (21.0,25.4)
BMI: Overweight	6,820	56,307,810	31.4 (30.6,32.3)	911	12,523,597	31.1 (28.9,33.4)
BMI: Not OW/OB	11,945	48,332,329	51.3 (50.4,52.2)	1,463	15,519,308	45.8 (43.4,48.2)
Smoke: Ever	11,830	92,553,663	48.8 (47.9,49.7)	1,423	20,037,676	41.4 (39.1,43.8)
Smoke: Never	11,036	32,530,271	51.2 (50.3,52.1)	1,693	4,549,964	58.6 (56.2,60.9)
Healthcare coverage: Yes	21,015	36,435,827	92.1 (91.6,92.6)	2,809	11,032,643	90.0 (88.4,91.4)
Healthcare coverage: No	1,903	54,922,400	7.9 (7.4,8.4)	315	12,261,575	10.0 (8.6,11.6)
Healthcare provider: Yes	19,060	76,635,286	80.3 (79.6,81.1)	2,541	14,743,148	79.4 (77.3,81.4)
Healthcare provider: No	3,848	81,157,754	19.7 (18.9,20.4)	577	15,675,688	20.6 (18.6,22.7)
Healthcare utilization: Yes	13,070	92,341,442	79.2 (78.3,80.1)	1,736	24,632,286	80.4 (77.9,82.6)
Healthcare utilization: No	3,488	151,230,035	20.8 (19.9,21.7)	440	29,816,349	19.6 (17.4,22.1)
Healthcare utilization includes only 2005-2010 data due to missing in the earlier time period.						

Overall Asthma Prevalence and Associations in Hawai‘i

In Hawai‘i the 2001-2010 overall crude prevalence of ever having been diagnosed with asthma was 14.7%, and prevalence of currently having asthma was 8.0% (Table 2.2). However, asthma prevalence increased with time and varied across sociodemographic strata. For example, both lifetime and current asthma prevalence estimates were independently and strongly associated with younger age (< 65 years), obesity, and NHOPI race. Asthma was also more common among women than men, and among ever-smokers than never-smokers. Healthcare coverage did not predict asthma prevalence, while having either a healthcare provider or recent healthcare utilization did predict current asthma in Hawai‘i.

Asthma prevalence was higher in Hawai‘i (Table 2.2) than in the continental US population (Table 1.2), regardless of race: All racial groupings exhibited elevated lifetime and current asthma prevalence in Hawai‘i when compared to prevalence estimates by race from the US overall. However, NHOPI and Asians were especially more likely than other races to have had an ever-diagnosis of asthma in Hawai‘i compared to elsewhere in the US. Moreover, asthma prevalence increased more with time in Hawai‘i than in the US: Overall lifetime asthma prevalence in Hawai‘i increased to 16.9% in 2008-2010, and current asthma to 9.5%, which consisted of 40% increases from the 2001-2003 baseline. In contrast, asthma increased by about 10% in the overall US population between the same two time periods. Similarly, magnitudes of asthma associations were stronger in Hawai‘i for young age and obesity than in the continental US. However, asthma associations with female sex and ever-smoking were not different between Hawai‘i and the mainland US population. Similarly, relationships between aspects of healthcare and asthma prevalence were also not substantially modified by residence in Hawai‘i, although near-universal healthcare coverage in Hawai‘i limited comparisons for some strata.

Asthma Prevalence Disparities By Race in Hawai‘i

Among the predominant racial groups in Hawai‘i, those identifying as NHOPI had the highest crude asthma prevalence estimates for both lifetime (P%=20.9%) and current (P%=12.2%) asthma (Table 2.2). Overall lifetime asthma prevalence estimates were not demonstrably different between Asians (P%=13.3%), Whites (P%=14.0%), and those of Other race (P%=14.7%). Asians had the lowest current asthma prevalence (P%=6.6%), while current asthma prevalence estimates were not demonstrably different between Whites (P%=8.1%) or those of Other race (P%=8.2%).

However, racial disparities in asthma prevalence in Hawai'i differed between sexes; asthma disparities by race were greater among women, except for NHOPI (Tables 2.5 and 2.6). Similarly, current asthma was strongly associated with female sex within all racial subpopulations, but the strength of the association was not consistent among the different racial groupings.

Table 2.5. Hawai'i, by sex or race - Lifetime asthma crude prevalence and unadjusted race/sex associations with lifetime asthma - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i		Associations between asthma and race	Associations between asthma and sex
Women – Lifetime asthma			
	Prevalence, P% (95%CI)	**Prevalence ratio, PR (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	22.9 (21.2,24.8)	1.7 (1.5,1.9)	1.2 (1.1,1.4)
Race: White	17.1 (16.2,18.1)	1.3 (1.2,1.4)	1.5 (1.4,1.7)
Race: Other	18.3 (16.0,20.9)	1.4 (1.2,1.6)	1.6 (1.2,2.0)
Race: Asian	13.4 (12.6,14.2)	1.0 (ref)	1.0 (0.9,1.1)
Men – Lifetime asthma			
	Prevalence, P% (95%CI)	**Prevalence ratio, PR (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	18.7 (16.6,21.0)	1.4 (1.2,1.6)	1.0(ref)
Race: White	11.2 (10.3,12.1)	0.8 (0.8,0.9)	1.0(ref)
Race: Other	11.6 (9.5,14.1)	0.9 (0.7,1.1)	1.0(ref)
Race: Asian	13.2 (12.2,14.2)	1.0 (ref)	1.0(ref)

Table 2.6. Hawai'i, by sex or race - Current asthma crude prevalence and unadjusted race/sex associations with lifetime asthma - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i		Associations between asthma and race	Associations between asthma and sex
Women – Current asthma			
	Prevalence, P% (95%CI)	**Prevalence ratio, PR (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	15.6 (14.1,17.2)	2.1 (1.8,2.4)	1.9 (1.5,2.3)
Race: White	11.2 (10.5,12.1)	1.5 (1.3,1.7)	2.1 (1.9,2.5)
Race: Other	11.9 (10.0,14.0)	1.6 (1.3,1.9)	2.4 (1.7,3.4)
Race: Asian	7.5 (6.9,8.2)	1.0 (ref)	1.3 (1.2,1.6)
Men – Current asthma			
	Prevalence, P% (95%CI)	**Prevalence ratio, PR (95%CI)**	**Prevalence ratio, PR (95%CI)**
Race: NHOPI	8.4 (7.0,10.1)	1.5 (1.2,1.9)	1.0(ref)
Race: White	5.3 (4.7,5.9)	0.9 (0.8,1.1)	1.0(ref)
Race: Other	5.0 (3.6,6.7)	0.9 (0.6,1.2)	1.0(ref)
Race: Asian	5.6 (5.0,6.4)	1.0 (ref)	1.0(ref)

Asthma in Hawai'i Among Native Hawaiians/Other Pacific Islander Women and Men

Overall crude lifetime asthma prevalence among NHOPI in Hawai'i was 60% higher than for Asians, and current asthma prevalence was 80% higher (Table 2.2). After stratification by sex and adjustment for potential confounders, such disparities were substantially reduced for NHOPI men with lifetime asthma, but not for NHOPI women with either lifetime or current asthma (Tables 2.5 and 2.6).

Sociodemographic associations with asthma prevalence among NHOP were modified by sex (Tables 2.7 and 2.8). For example, 28.6% of obese NHOPI women reported lifetime asthma compared to 21.1% of obese NHOPI men, whereas 21.0% of obese NHOPI women reported current asthma compared to 10.0% of obese NHOPI men. Similarly, NHOPI women who were ever-smokers had substantially higher asthma prevalence than NHOPI men with the same smoking status, including after adjustment.

There was increased lifetime asthma prevalence with time among NHOPI men in Hawai'i (aPR=1.6; 2008-2010 versus 2001-2003) after adjustment for other covariates, but not among NHOPI women (Tables 2.7 and 2.8). Among NHOPI men, adjusted lifetime asthma prevalence was strongly associated with young age (aPR=2.8; 18-34 versus ≥ 65 years). Obesity strongly predicted lifetime and current asthma among NHOPI women but not lifetime asthma among NHOPI men. For example, after controlling for covariates NHOPI women with obese BMI were 70% more likely to report current asthma than NHOPI women with a BMI that was not categorized as overweight/obese. In addition, smoking was associated with both lifetime (aPR=1.3) and current (aPR=1.4) asthma among NHOPI women but not men. Having a healthcare provider was marginally associated with asthma for NHOPI women, but small sample sizes both for NHOPI and some strata of the healthcare-related covariates limited comparisons.

Within nearly all sociodemographic categories, asthma prevalence was higher among NHOPI women and men residing in Hawai‘i compared to the continental US population, although differences were not always statistically significant (Tables 1.7, 1.8, 2.7, and 2.8). The magnitudes of adjusted sociodemographic associations with asthma were similar between the Hawai‘i and the continental US population of women NHOPI. Among NHOPI men, the association between young age (< 65 years) and an asthma ever-diagnosis was somewhat greater in Hawai‘i, whereas lifetime asthma associations with obesity and smoking were somewhat stronger in the overall US population compared to in Hawai‘i alone. Also, for nearly all sociodemographic categories, adjusted lifetime and current asthma prevalence point estimates were higher among NHOPI women (Figure 1) and men (Figure 2) than among Whites and Asians of the same sex.

Table 2.7. Hawai'i, Native Hawaiian/Other Pacific Islander (NHOPI) women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	NHOPI Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Time period: 2008-2010	23.4 (20.4,26.6)	1.2 (1.0,1.6)	1.1 (0.9,1.4)	16.0 (13.6,18.7)	1.2 (0.9,1.6)	1.1 (0.8,1.4)
Time period: 2005-2007	25.6 (22.7,28.7)	1.4 (1.1,1.7)	1.2 (1.0,1.5)	17.2 (14.8,19.9)	1.3 (1.0,1.7)	1.1 (0.9,1.5)
Time period: 2001-2003	18.8 (15.7,22.2)	1.0 (ref)	1.0 (ref)	13.1 (10.5,16.2)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	23.0 (19.8,26.4)	1.2 (0.9,1.5)	1.2 (0.9,1.6)	14.5 (12.0,17.3)	1.1 (0.8,1.5)	1.2 (0.9,1.7)
Age: 35-64 years	23.7 (21.4,26.2)	1.2 (1.0,1.5)	1.2 (0.9,1.5)	17.3 (15.2,19.6)	1.3 (1.0,1.8)	1.3 (1.0,1.8)
Age: >=65 years	19.7 (16.0,23.9)	1.0 (ref)	1.0 (ref)	12.9 (10.1,16.2)	1.0 (ref)	1.0 (ref)
BMI: Obese	28.6 (25.3,32.1)	1.6 (1.3,1.9)	1.5 (1.2,1.8)	21.0 (18.1,24.2)	1.8 (1.5,2.3)	1.7 (1.4,2.2)
BMI: Overweight	21.1 (18.0,24.7)	1.2 (0.9,1.4)	1.1 (0.9,1.4)	13.4 (11.0,16.3)	1.2 (0.9,1.5)	1.1 (0.9,1.5)
BMI: Not OW/OB	18.1 (15.7,20.9)	1.0 (ref)	1.0 (ref)	11.4 (9.5,13.7)	1.0 (ref)	1.0 (ref)
Smoke: Ever	26.1 (23.5,28.8)	1.3 (1.1,1.5)	1.3 (1.1,1.5)	18.4 (16.2,20.8)	1.4 (1.1,1.7)	1.4 (1.1,1.7)
Smoke: Never	20.1 (17.8,22.7)	1.0 (ref)	1.0 (ref)	13.2 (11.4,15.4)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	23.0 (21.2,24.9)	1.0 (0.7,1.4)	1.0 (0.7,1.3)	15.9 (14.4,17.6)	1.2 (0.8,1.9)	1.1 (0.7,1.7)
Healthcare coverage: No	22.4 (16.3,30.0)	1.0 (ref)	1.0 (ref)	12.8 (8.4,19.1)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	23.6 (21.8,25.6)	1.3 (1.0,1.7)	1.4 (1.0,1.8)	16.3 (14.7,18.0)	1.5 (1.0,2.1)	1.4 (1.0,2.1)
Healthcare provider: No	18.2 (13.9,23.5)	1.0 (ref)	1.0 (ref)	11.2 (7.8,15.8)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	24.2 (22.0,26.6)	0.9 (0.7,1.2)	0.9 (0.7,1.1)	16.5 (14.6,18.5)	1.0 (0.7,1.3)	0.9 (0.7,1.2)
Healthcare utilization: No	25.6 (20.4,31.7)	1.0 (ref)	1.0 (ref)	16.9 (12.7,22.3)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Time period, age, BMI, smoking, healthcare coverage, and healthcare provider.						

Table 2.8. Hawai'i, Native Hawaiian/Other Pacific Islander (NHOPI) men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	NHOPI Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Time period: 2008-2010	24.1 (20.2,28.6)	1.7 (1.3,2.3)	1.6 (1.1,2.2)	10.6 (8.0,13.8)	1.5 (0.9,2.4)	NA
Time period: 2005-2007	16.6 (13.5,20.4)	1.2 (0.8,1.6)	1.1 (0.8,1.6)	7.3 (5.1,10.2)	1.0 (0.6,1.8)	NA
Time period: 2001-2003	14.1 (10.8,18.1)	1.0 (ref)	1.0 (ref)	6.9 (4.7,10.2)	1.0 (ref)	NA
Age: 18-34 years	23.2 (19.4,27.6)	2.8 (1.8,4.3)	2.8 (1.8,4.4)	9.3 (6.9,12.5)	NA	NA
Age: 35-64 years	16.5 (14.1,19.3)	2.0 (1.3,3.0)	2.0 (1.3,3.0)	8.3 (6.5,10.6)	NA	NA
Age: >=65 years	8.2 (5.6,12.0)	1.0 (ref)	1.0 (ref)	NA	NA	NA
BMI: Obese	21.1 (17.7,24.9)	1.2 (0.9,1.7)	1.1 (0.8,1.5)	10.0 (7.8,12.8)	1.5 (0.9,2.5)	NA
BMI: Overweight	16.7 (13.2,20.9)	1.0 (0.7,1.4)	0.9 (0.6,1.3)	7.8 (5.3,11.3)	1.2 (0.7,2.1)	NA
BMI: Not OW/OB	17.1 (13.2,21.8)	1.0 (ref)	1.0 (ref)	6.5 (4.2,10.0)	1.0 (ref)	NA
Smoke: Ever	16.6 (14.0,19.6)	0.8 (0.6,1.0)	0.9 (0.7,1.1)	7.2 (5.5,9.5)	0.7 (0.5,1.1)	NA
Smoke: Never	20.9 (17.6,24.6)	1.0 (ref)	1.0 (ref)	9.7 (7.5,12.4)	1.0 (ref)	NA
Healthcare coverage: Yes	18.7 (16.5,21.2)	1.0 (0.7,1.5)	1.0 (0.7,1.6)	8.5 (7.0,10.4)	NA	NA
Healthcare coverage: No	18.5 (12.2,27.0)	1.0 (ref)	1.0 (ref)	NA	NA	NA
Healthcare provider: Yes	19.2 (16.8,21.8)	1.1 (0.8,1.5)	1.2 (0.9,1.7)	9.4 (7.6,11.5)	1.8 (1.1,2.9)	NA
Healthcare provider: No	17.4 (13.0,22.7)	1.0 (ref)	1.0 (ref)	5.3 (3.3,8.3)	1.0 (ref)	NA
Healthcare utilization: Yes	19.2 (16.3,22.5)	0.8 (0.6,1.0)	0.8 (0.6,1.1)	9.5 (7.5,12.1)	1.2 (0.7,2.1)	NA
Healthcare utilization: No	24.9 (19.3,31.4)	1.0 (ref)	1.0 (ref)	7.6 (4.8,12.0)	1.0 (ref)	NA
[a]Adjusted for: Time period, age, BMI, smoking, healthcare coverage, and healthcare provider.						

Asthma in Hawai'i Among Asian Women and Men

Lower asthma prevalence among Asians compared to Whites was observed in the Hawai'i population only among women (Tables 2.9, 2.10, 2.11, and 2.12). Furthermore, across all racial groups asthma prevalence estimates were lowest among women identifying as Asian within many sociodemographic categories. In contrast, point estimates of lifetime asthma prevalence were sometimes higher for Asian than for White men, although this racial difference was statistically significant only in the categories of overweight BMI and not having a healthcare provider. Current asthma prevalence was not demonstrably different between men of Asian or White race in any sociodemographic category.

Asian women in Hawai'i demonstrated higher lifetime asthma prevalence than Asian men only in the categories of mid-age (35-64 years) and ever-smoking (Tables 2.9 and 2.10). In contrast, prevalence of current asthma was consistently higher for Asian women than men within many sociodemographic categories. For example, 14.8% of obese Asian women reported current asthma, compared to 8.4% of obese Asian men. Similarly, prevalence of current asthma among Asian women ever-smokers was 10.2%, compared to 5.7% among Asian male current or former smokers.

Among all Asians regardless of gender, young age (18-34 years) and obesity were associated with adjusted lifetime and current asthma (Tables 2.9 and 2.10). Among Asian women, but not Asian men, ever-smoking was associated with lifetime (aPR=1.4) and current (aPR=1.6) asthma after controlling for other covariates. Asthma prevalence increased with time among Asian women in Hawai'i, but not among Asian men. No meaningful associations between asthma and aspects of healthcare were observed among Asian women and men, but small sample sizes in Hawai'i for these covariates limited comparisons.

Asthma was much more common among Asians residing in Hawai'i (Tables 2.9 and 2.10) compared to those in the continental US population (Tables 1.9 and 1.10), for all sociodemographic categories and regardless of sex. However, this modification of asthma prevalence by Hawai'i residence was somewhat greater for Asian women than men, and also varied by sociodemographic characteristic and type of asthma. For example, an asthma ever-diagnosis was significantly more common for Asian women with obesity (P%=21.7%) or ever-smoking (P%=17.1%) who resided in Hawai'i than those in the mainland US (P%=14.7% and P%=12.8%, respectively); for Asian men with obesity or ever-smoking lifetime asthma was 18.1% and 12.5% respectively in Hawai'i, compared to 15.3% and 7.4% in the US. Current asthma prevalence in the youngest age group (18-34 years) was at least twice as high among Asians in Hawai'i than in the continental US, regardless of sex. After controlling for other covariates among Asian women and men, young age was markedly and more strongly associated with asthma in Hawai'i than in the overall US population.

Table 2.9. Hawai'i, Asian women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	Asian Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Time period: 2008-2010	16.1 (14.7,17.8)	1.5 (1.3,1.7)	1.4 (1.2,1.6)	9.4 (8.3,10.7)	1.6 (1.3,1.9)	1.4 (1.1,1.8)
Time period: 2005-2007	12.9 (11.6,14.2)	1.2 (1.0,1.4)	1.1 (0.9,1.3)	7.1 (6.2,8.1)	1.2 (0.9,1.5)	1.1 (0.9,1.4)
Time period: 2001-2003	11.0 (9.7,12.5)	1.0 (ref)	1.0 (ref)	6.0 (5.1,7.2)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	15.9 (13.9,18.2)	1.8 (1.5,2.1)	1.8 (1.5,2.1)	8.9 (7.4,10.6)	1.8 (1.4,2.2)	1.8 (1.4,2.2)
Age: 35-64 years	14.5 (13.4,15.6)	1.6 (1.4,1.9)	1.5 (1.3,1.8)	8.2 (7.4,9.1)	1.6 (1.3,2.0)	1.5 (1.2,1.8)
Age: >=65 years	9.0 (7.9,10.1)	1.0 (ref)	1.0 (ref)	5.1 (4.3,5.9)	1.0 (ref)	1.0 (ref)
BMI: Obese	21.7 (18.8,24.9)	1.8 (1.6,2.2)	1.7 (1.4,2.0)	14.8 (12.4,17.5)	2.3 (1.9,2.9)	2.1 (1.7,2.6)
BMI: Overweight	14.3 (12.6,16.2)	1.2 (1.0,1.4)	1.2 (1.0,1.4)	8.0 (6.7,9.4)	1.3 (1.0,1.5)	1.2 (1.0,1.5)
BMI: Not OW/OB	11.8 (10.8,12.8)	1.0 (ref)	1.0 (ref)	6.3 (5.6,7.1)	1.0 (ref)	1.0 (ref)
Smoke: Ever	17.1 (15.5,18.8)	1.4 (1.3,1.6)	1.4 (1.2,1.6)	10.2 (9.0,11.6)	1.6 (1.3,1.8)	1.5 (1.2,1.7)
Smoke: Never	12.1 (11.2,13.0)	1.0 (ref)	1.0 (ref)	6.6 (5.9,7.3)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	13.4 (12.6,14.3)	1.1 (0.8,1.5)	1.2 (0.8,1.7)	7.5 (6.9,8.2)	0.9 (0.6,1.4)	1.0 (0.7,1.6)
Healthcare coverage: No	12.6 (8.9,17.5)	1.0 (ref)	1.0 (ref)	8.1 (5.3,12.3)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	13.5 (12.7,14.4)	1.1 (0.9,1.5)	1.2 (0.9,1.6)	7.6 (7.0,8.3)	1.2 (0.8,1.8)	1.3 (0.9,1.9)
Healthcare provider: No	12.1 (9.3,15.5)	1.0 (ref)	1.0 (ref)	6.2 (4.3,9.0)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	14.3 (13.3,15.4)	1.0 (0.8,1.2)	1.1 (0.9,1.3)	8.5 (7.7,9.4)	1.2 (0.9,1.6)	1.4 (1.1,1.8)
Healthcare utilization: No	15.0 (12.5,17.7)	1.0 (ref)	1.0 (ref)	7.0 (5.4,9.0)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Time period, age, BMI, smoking, healthcare coverage, and healthcare provider.						

Table 2.10. Hawai'i, Asian men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	Asian Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Time period: 2008-2010	14.9 (13.2,16.8)	1.3 (1.1,1.6)	1.2 (1.0,1.5)	6.6 (5.4,7.9)	1.4 (1.0,1.9)	1.3 (1.0,1.8)
Time period: 2005-2007	13.0 (11.3,14.9)	1.1 (0.9,1.4)	1.1 (0.9,1.3)	5.5 (4.4,6.9)	1.2 (0.8,1.6)	1.1 (0.8,1.5)
Time period: 2001-2003	11.4 (9.8,13.1)	1.0 (ref)	1.0 (ref)	4.8 (3.8,6.0)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	18.7 (16.2,21.4)	2.7 (2.1,3.4)	2.7 (2.1,3.4)	7.9 (6.2,9.9)	2.0 (1.4,2.7)	2.0 (1.4,2.9)
Age: 35-64 years	12.2 (11.1,13.4)	1.8 (1.4,2.1)	1.7 (1.4,2.1)	4.9 (4.2,5.7)	1.2 (0.9,1.6)	1.3 (0.9,1.7)
Age: >=65 years	7.0 (5.8,8.3)	1.0 (ref)	1.0 (ref)	4.0 (3.2,5.1)	1.0 (ref)	1.0 (ref)
BMI: Obese	18.1 (15.2,21.5)	1.5 (1.2,1.8)	1.3 (1.1,1.7)	8.4 (6.5,10.9)	1.5 (1.1,2.1)	1.4 (1.0,2.0)
BMI: Overweight	12.1 (10.7,13.7)	1.0 (0.8,1.2)	0.9 (0.8,1.1)	4.6 (3.8,5.7)	0.8 (0.6,1.1)	0.8 (0.6,1.1)
BMI: Not OW/OB	12.5 (11.1,14.1)	1.0 (ref)	1.0 (ref)	5.6 (4.6,6.8)	1.0 (ref)	1.0 (ref)
Smoke: Ever	12.5 (11.2,14.0)	0.9 (0.8,1.1)	1.0 (0.9,1.2)	5.7 (4.8,6.8)	1.0 (0.8,1.3)	1.1 (0.9,1.5)
Smoke: Never	13.5 (12.2,15.1)	1.0 (ref)	1.0 (ref)	5.5 (4.6,6.5)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	12.9 (11.9,14.0)	0.8 (0.6,1.1)	1.0 (0.7,1.4)	5.4 (4.8,6.2)	0.6 (0.4,1.0)	0.7 (0.4,1.2)
Healthcare coverage: No	16.4 (12.0,22.0)	1.0 (ref)	1.0 (ref)	8.5 (5.3,13.5)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	12.8 (11.8,13.9)	0.8 (0.7,1.1)	1.0 (0.8,1.3)	5.6 (4.9,6.4)	0.9 (0.7,1.3)	1.2 (0.8,1.8)
Healthcare provider: No	15.2 (12.4,18.4)	1.0 (ref)	1.0 (ref)	5.9 (4.2,8.2)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	13.3 (12.0,14.7)	0.8 (0.7,1.0)	1.0 (0.8,1.2)	6.3 (5.4,7.4)	1.2 (0.8,1.9)	1.4 (0.9,2.1)
Healthcare utilization: No	16.1 (13.2,19.4)	1.0 (ref)	1.0 (ref)	5.1 (3.5,7.3)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Time period, age, BMI, smoking, healthcare coverage, and healthcare provider.						

Asthma in Hawai'i Among White Women and Men

Female sex was more strongly associated with current asthma among Whites (PR=2.1) than among Asians (PR=1.3) (Table 2.6), and lifetime asthma prevalence was also elevated more for women compared to men among Whites (PR=1.5) than among Asians (PR=1.0) (Table 2.5). Moreover, disparities in asthma prevalence between White women and men were demonstrated in nearly all sociodemographic strata examined (Tables 2.11 and 2.12). For example, 18.4% of obese White women reported current asthma, compared to 8.5% of obese White men; prevalence of current asthma among White overweight women was 11.1%, but was just 4.6% among White overweight men.

Obesity was strongly associated with current asthma among Whites of both genders (Tables 2.11 and 2.12), and more for lifetime asthma among White women than men. Associations between asthma prevalence and smoking were not demonstrated among White men, but among White women current smoking predicted both lifetime (aPR=1.1) and current asthma (aPR=1.2). Young age (18-34 years) was strongly associated with lifetime asthma prevalence for Whites regardless of gender (aPR=1.7), while this younger age category predicted current asthma prevalence more strongly for White women (aPR=1.7) than men (aPR=1.2).

Table 2.11. Hawai'i, White women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	White Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Time period: 2008-2010	18.5 (16.9,20.2)	1.2 (1.0,1.3)	1.1 (0.9,1.3)	13.3 (11.8,14.9)	1.3 (1.1,1.6)	1.2 (1.0,1.5)
Time period: 2005-2007	16.9 (15.5,18.5)	1.1 (0.9,1.2)	1.0 (0.9,1.2)	10.6 (9.4,11.9)	1.1 (0.9,1.3)	1.0 (0.8,1.2)
Time period: 2001-2003	16.0 (14.4,17.7)	1.0 (ref)	1.0 (ref)	9.9 (8.6,11.4)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	20.9 (18.6,23.4)	1.6 (1.3,1.9)	1.7 (1.4,2.0)	13.5 (11.6,15.7)	1.5 (1.2,1.9)	1.7 (1.3,2.1)
Age: 35-64 years	16.8 (15.7,17.9)	1.3 (1.1,1.5)	1.3 (1.1,1.5)	11.0 (10.1,12.0)	1.2 (1.0,1.5)	1.3 (1.0,1.5)
Age: >=65 years	13.3 (11.6,15.1)	1.0 (ref)	1.0 (ref)	9.1 (7.6,10.8)	1.0 (ref)	1.0 (ref)
BMI: Obese	25.9 (23.3,28.6)	1.7 (1.5,2.0)	1.7 (1.5,2.0)	18.4 (16.1,20.9)	2.0 (1.7,2.4)	1.9 (1.6,2.3)
BMI: Overweight	16.7 (14.8,18.7)	1.1 (1.0,1.3)	1.1 (1.0,1.3)	11.1 (9.6,12.9)	1.2 (1.0,1.5)	1.2 (1.0,1.4)
BMI: Not OW/OB	14.8 (13.7,16.0)	1.0 (ref)	1.0 (ref)	9.2 (8.2,10.2)	1.0 (ref)	1.0 (ref)
Smoke: Ever	18.2 (16.9,19.6)	1.1 (1.0,1.2)	1.1 (1.0,1.3)	12.1 (11.0,13.3)	1.1 (1.0,1.3)	1.2 (1.0,1.3)
Smoke: Never	16.3 (15.0,17.6)	1.0 (ref)	1.0 (ref)	10.6 (9.5,11.7)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	17.1 (16.1,18.1)	1.0 (0.8,1.2)	1.0 (0.8,1.3)	11.3 (10.5,12.1)	1.0 (0.8,1.4)	1.0 (0.8,1.4)
Healthcare coverage: No	17.7 (14.2,21.8)	1.0 (ref)	1.0 (ref)	10.9 (8.0,14.7)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	17.3 (16.3,18.4)	1.1 (0.9,1.3)	1.1 (1.0,1.4)	11.6 (10.8,12.5)	1.3 (1.0,1.7)	1.3 (1.0,1.7)
Healthcare provider: No	16.0 (13.7,18.7)	1.0 (ref)	1.0 (ref)	8.9 (7.0,11.3)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	17.8 (16.6,19.1)	1.1 (0.9,1.2)	1.0 (0.9,1.2)	12.2 (11.2,13.4)	1.2 (1.0,1.5)	1.2 (0.9,1.5)
Healthcare utilization: No	16.9 (14.5,19.6)	1.0 (ref)	1.0 (ref)	9.9 (8.1,12.1)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Time period, age, BMI, smoking, healthcare coverage, and healthcare provider.						

Table 2.12. Hawai'i, White men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	White Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Time period: 2008-2010	12.8 (11.2,14.5)	1.4 (1.1,1.7)	1.4 (1.1,1.7)	6.3 (5.3,7.6)	1.6 (1.2,2.2)	1.4 (1.0,1.9)
Time period: 2005-2007	11.6 (10.0,13.3)	1.3 (1.0,1.6)	1.3 (1.0,1.6)	5.5 (4.5,6.7)	1.4 (1.0,1.9)	1.2 (0.9,1.7)
Time period: 2001-2003	9.2 (7.8,10.7)	1.0 (ref)	1.0 (ref)	4.0 (3.1,5.1)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	14.3 (12.1,16.8)	1.6 (1.2,2.0)	1.7 (1.4,2.2)	5.2 (3.9,6.8)	1.0 (0.7,1.5)	1.2 (0.8,1.7)
Age: 35-64 years	10.2 (9.2,11.2)	1.1 (0.9,1.4)	1.2 (0.9,1.4)	5.4 (4.6,6.2)	1.1 (0.8,1.4)	1.1 (0.8,1.5)
Age: >=65 years	9.1 (7.7,10.8)	1.0 (ref)	1.0 (ref)	5.1 (4.0,6.5)	1.0 (ref)	1.0 (ref)
BMI: Obese	15.3 (12.9,18.1)	1.3 (1.1,1.6)	1.3 (1.0,1.6)	8.5 (6.7,10.7)	1.9 (1.4,2.5)	1.7 (1.2,2.3)
BMI: Overweight	9.0 (7.8,10.3)	0.8 (0.6,0.9)	0.8 (0.6,0.9)	4.6 (3.8,5.6)	1.0 (0.8,1.3)	0.9 (0.7,1.3)
BMI: Not OW/OB	11.5 (10.2,13.0)	1.0 (ref)	1.0 (ref)	4.6 (3.8,5.5)	1.0 (ref)	1.0 (ref)
Smoke: Ever	11.4 (10.2,12.7)	1.0 (0.9,1.2)	1.1 (0.9,1.2)	5.5 (4.7,6.4)	1.1 (0.9,1.4)	1.1 (0.8,1.4)
Smoke: Never	11.0 (9.7,12.4)	1.0 (ref)	1.0 (ref)	5.0 (4.2,6.1)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	11.1 (10.2,12.1)	0.9 (0.7,1.3)	0.9 (0.7,1.2)	5.3 (4.7,6.0)	1.1 (0.6,1.7)	0.8 (0.5,1.3)
Healthcare coverage: No	11.9 (8.7,16.1)	1.0 (ref)	1.0 (ref)	5.0 (3.1,8.0)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	11.6 (10.6,12.7)	1.2 (0.9,1.5)	1.3 (1.0,1.6)	5.8 (5.2,6.6)	1.7 (1.1,2.4)	1.7 (1.1,2.4)
Healthcare provider: No	9.9 (8.1,12.0)	1.0 (ref)	1.0 (ref)	3.5 (2.4,5.0)	1.0 (ref)	1.0 (ref)
Healthcare utilization: Yes	12.4 (11.1,13.8)	1.1 (0.9,1.4)	1.1 (0.9,1.4)	6.1 (5.2,7.1)	1.1 (0.8,1.6)	1.1 (0.8,1.5)
Healthcare utilization: No	11.4 (9.4,13.8)	1.0 (ref)	1.0 (ref)	5.4 (4.1,7.2)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Time period, age, BMI, smoking, healthcare coverage, and healthcare provider.						

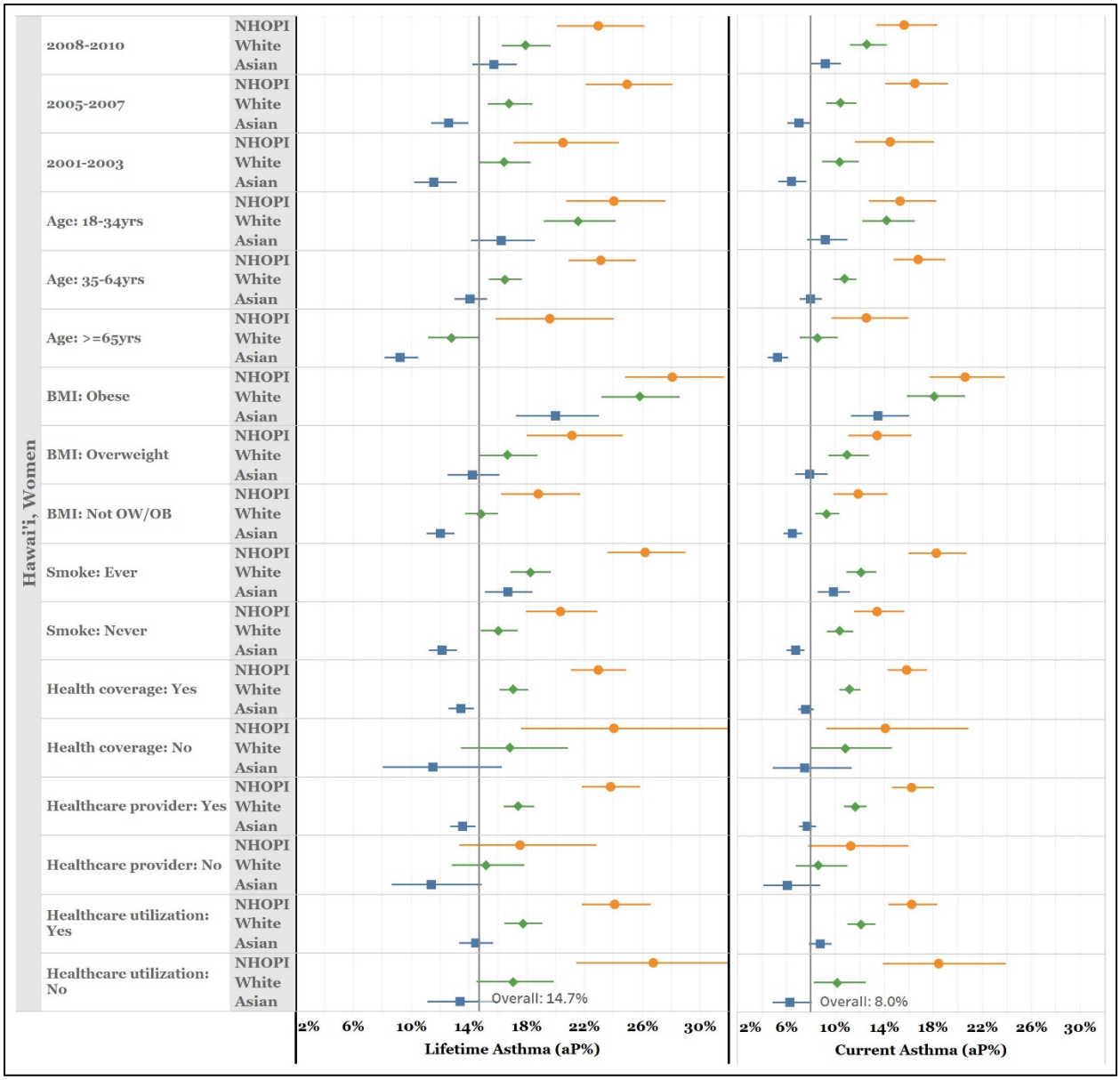

Figure 2.1. Hawai'i, Women - Adjusted lifetime and current asthma prevalence, by race and sociodemographic characteristics - Behavioral Risk Factor Surveillance System, 2001-2010. Estimates adjusted within sex/race for all covariates shown.

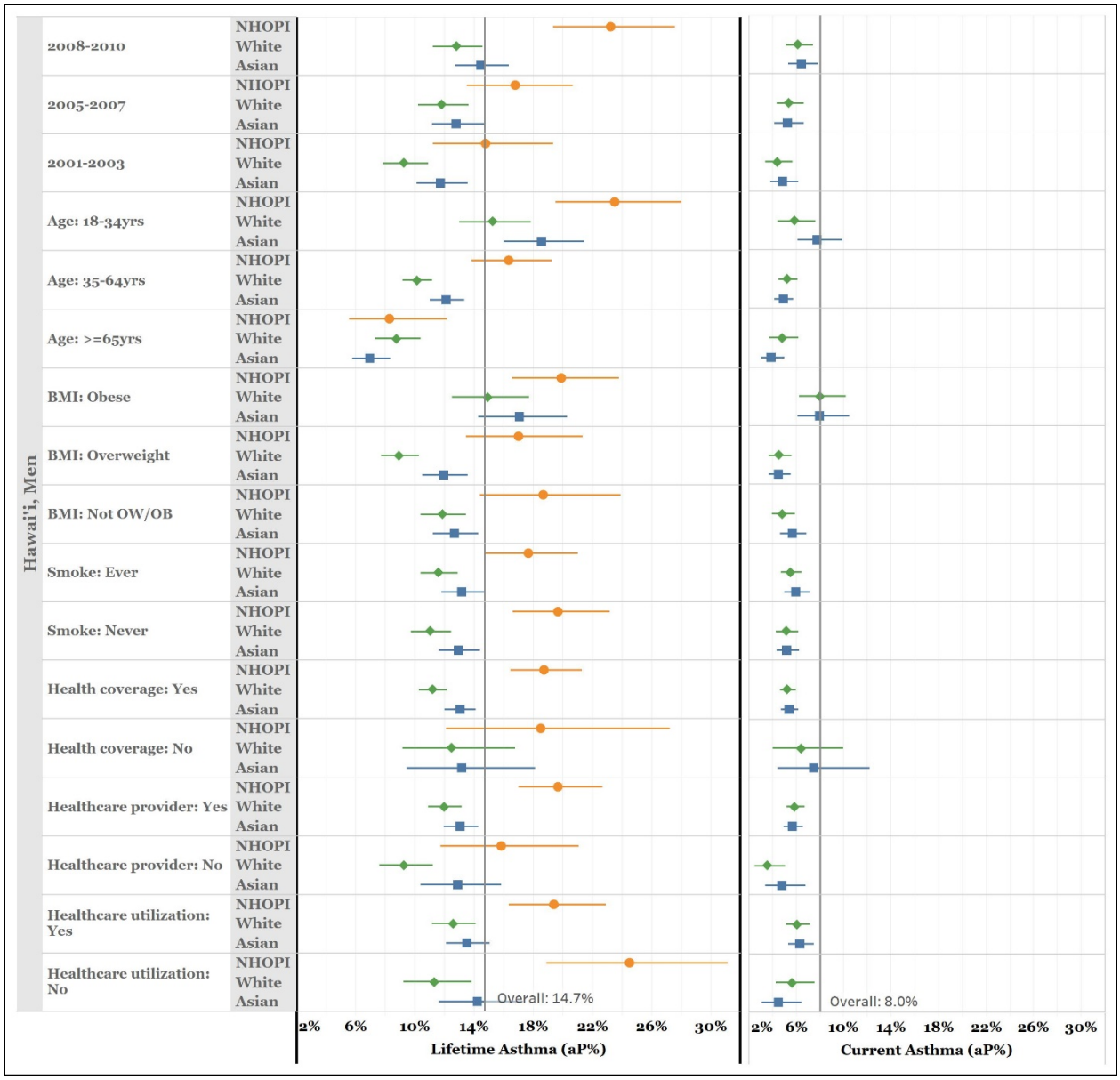

Figure 2.2. Hawai'i, Men - Adjusted lifetime and current asthma prevalence, by race and sociodemographic characteristics - Behavioral Risk Factor Surveillance System, 2001-2010. Estimates adjusted within sex/race for all covariates shown.

Asthma in Hawai'i Among Women and Men of Races Other Than NHOPI, Asian, or White

Due to small sample sizes for those in Hawai'i not best identifying as either NHOPI, Asian, or White, there was reduced power to detect differences in asthma prevalence for those of Other race, and insufficient sample sizes for multivariable adjustment within this racial category (Tables 2.13 and 2.14, and Appendix Table 5.10). However, those of Other race did demonstrate lower overall crude asthma prevalence compared to NHOPI, regardless of gender. Moreover, those of Other race had crude asthma prevalence estimates lower than NHOPI of the same gender in several sociodemographic categories, including covariates related to healthcare.

Table 2.13. Hawai'i, Other race women – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	Other Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Time period: 2008-2010	19.5 (15.4,24.3)	1.2 (0.9,1.7)	NA	14.4 (11.0,18.7)	1.5 (0.9,2.3)	NA
Time period: 2005-2007	19.7 (16.0,23.9)	1.2 (0.9,1.7)	NA	11.7 (8.9,15.3)	1.2 (0.8,1.9)	NA
Time period: 2001-2003	16.0 (12.1,20.7)	1.0 (ref)	NA	9.8 (6.8,14.0)	1.0 (ref)	NA
Age: 18-34 years	18.1 (14.2,22.8)	1.6 (1.1,2.5)	NA	11.7 (8.5,15.7)	1.5 (0.9,2.5)	NA
Age: 35-64 years	20.2 (17.0,23.9)	1.8 (1.2,2.7)	NA	13.3 (10.7,16.5)	1.7 (1.1,2.7)	NA
Age: >=65 years	11.1 (7.7,15.8)	1.0 (ref)	NA	7.8 (5.1,11.8)	1.0 (ref)	NA
BMI: Obese	27.0 (20.7,34.3)	1.6 (1.2,2.2)	NA	16.5 (11.8,22.6)	1.5 (1.0,2.2)	NA
BMI: Overweight	15.7 (11.9,20.5)	0.9 (0.7,1.3)	NA	11.2 (7.9,15.6)	1.0 (0.7,1.5)	NA
BMI: Not OW/OB	17.0 (14.0,20.6)	1.0 (ref)	NA	11.2 (8.7,14.3)	1.0 (ref)	NA
Smoke: Ever	19.7 (15.9,24.2)	1.1 (0.9,1.5)	NA	13.0 (10.0,16.8)	1.1 (0.8,1.6)	NA
Smoke: Never	17.5 (14.8,20.7)	1.0 (ref)	NA	11.4 (9.1,14.2)	1.0 (ref)	NA
Healthcare coverage: Yes	18.5 (16.1,21.2)	NA	NA	12.4 (10.4,14.7)	NA	NA
Healthcare coverage: No	NA	NA	NA	NA	NA	NA
Healthcare provider: Yes	19.5 (16.9,22.4)	1.6 (1.1,2.4)	NA	12.6 (10.5,15.1)	NA	NA
Healthcare provider: No	12.0 (8.2,17.3)	1.0 (ref)	NA	NA	NA	NA
Healthcare utilization: Yes	18.7 (15.8,22.0)	0.8 (0.5,1.2)	NA	12.9 (10.5,15.7)	NA	NA
Healthcare utilization: No	23.8 (16.0,33.9)	1.0 (ref)	NA	NA	NA	NA

[a]Adjusted for: Time period, age, BMI, smoking, healthcare coverage, and healthcare provider.

Table 2.14. Hawai'i, Other race men – Lifetime and current asthma prevalence and sociodemographic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	Other Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Time period: 2008-2010	14.5 (10.6,19.6)	1.4 (0.9,2.3)	NA	5.1 (3.2,8.0)	NA	NA
Time period: 2005-2007	10.5 (7.4,14.9)	1.0 (0.6,1.7)	NA	5.1 (3.1,8.3)	NA	NA
Time period: 2001-2003	10.2 (7.0,14.8)	1.0 (ref)	NA	NA	NA	NA
Age: 18-34 years	12.1 (8.6,16.7)	NA	NA	NA	NA	NA
Age: 35-64 years	11.9 (9.1,15.5)	NA	NA	5.7 (3.7,8.5)	NA	NA
Age: >=65 years	NA	NA	NA	NA	NA	NA
BMI: Obese	16.8 (11.7,23.4)	2.0 (1.2,3.4)	NA	9.3 (5.6,14.9)	NA	NA
BMI: Overweight	11.5 (8.4,15.6)	1.4 (0.8,2.2)	NA	NA	NA	NA
BMI: Not OW/OB	8.4 (5.7,12.2)	1.0 (ref)	NA	NA	NA	NA
Smoke: Ever	15.4 (12.0,19.6)	2.0 (1.3,3.0)	NA	6.3 (4.1,9.4)	1.7 (0.9,3.1)	NA
Smoke: Never	7.8 (5.6,10.9)	1.0 (ref)	NA	3.7 (2.4,5.7)	1.0 (ref)	NA
Healthcare coverage: Yes	11.5 (9.2,14.2)	NA	NA	4.9 (3.5,6.8)	NA	NA
Healthcare coverage: No	NA	NA	NA	NA	NA	NA
Healthcare provider: Yes	11.6 (9.1,14.5)	1.0 (0.6,1.6)	NA	4.9 (3.5,7.0)	NA	NA
Healthcare provider: No	11.4 (7.6,16.8)	1.0 (ref)	NA	NA	NA	NA
Healthcare utilization: Yes	10.9 (8.2,14.3)	0.6 (0.4,1.0)	NA	5.5 (3.7,8.0)	NA	NA
Healthcare utilization: No	17.3 (11.3,25.6)	1.0 (ref)	NA	NA	NA	NA
[a]Adjusted for: Time period, age, BMI, smoking, healthcare coverage, and healthcare provider.						

DISCUSSION

A key finding from this investigation is the markedly high adjusted asthma prevalence among NHOPI compared to the other racial groups predominant in Hawai‘i, with persistence of elevated NHOPI asthma prevalence within many gender-specific sociodemographic strata (Figures 2.1 and 2.2). In addition, by demonstrating numerous differences of substantial magnitude between Asian and NHOPI demographics and asthma prevalence estimates, this work further demonstrates the importance of disaggregating NHOPI and Asian subpopulations in health studies, including in Hawai‘i (77, 78).

Other US cross-sectional studies have reported that current asthma prevalence is lower among Asians than Whites (25, 29). This study found that in Hawai‘i this was only true among women, for both lifetime and current asthma and within many sociodemographic categories; among males in Hawai‘i, the asthma prevalence point estimates were instead often lower for Whites than for Asians.

Consistent with other US cross-sectional investigations, as well as with study 1 for the US population overall, this investigation found univariate associations with lifetime and current asthma prevalence in Hawai‘i for the factors of female sex, age younger than 65 years, obesity, and smoking (8, 18, 25, 29, 49). Also in agreement with other studies, lifetime and current asthma estimates were higher overall among NHOPI (54, 77), and asthma prevalence in Hawai‘i had increased with time (8, 25).

Also consistent with many other studies, as well as study 1, female gender was observed to be a strong predictor of current asthma prevalence for the predominant races in Hawai‘i. Congruent with the findings of study 1 for the US overall population, in Hawai‘i sex modified associations with asthma to a much lesser degree among Asians: Lifetime asthma was elevated among Asian women compared to men only for ever-smokers. In Hawai‘i, the Asian subpopulation had the largest proportion of nonsmokers; Asians who do or did smoke were more often male, but only female Asian ever-smokers had elevated asthma prevalence compared to nonsmokers. Lack of asthma associations with smoking among Asian men might be explained by modest sample sizes. However, similar gender disparities among NHOPI and White smokers were also observed. Together these findings are congruent with biological mechanisms by which smoking could cause more asthmatic disease in women than men (89).

This study found that in Hawai‘i obesity was universally associated with asthma among women regardless of race, was associated with an asthma ever-diagnosis among Asian men, and was associated with current asthma among White men. Furthermore, adjusted current asthma

prevalence was consistently much higher for obese women compared to obese men of the same race. These findings, together with similar findings from study 1 for the overall US population, are consistent with other studies that have suggested an important and gender-mediated relationship between elevated BMI and asthma sequelae (21, 81).

This investigation was limited to covariates available in the BRFSS survey; other potentially important confounders were not included in our multivariable model. For example, volcanic gas on Hawai'i Island has been shown to be associated with respiratory problems that could influence self-reported asthma, such as cough, acute pharyngitis, wheezing, bronchitis, and/or other acute airway problems (90-94). Volcanic emissions dramatically increased in 2008 and have persisted (93, 94), with public perception and concerns over air quality on the most populated Hawaiian island (Oahu) and on Hawai'i Island. Other relevant environmental exposures not herein addressed include sugar cane harvesting by burning (95) and indoor air quality associated with tropical climate and/or dampness including household molds and cockroaches (86). Second-hand smoke exposure is yet another potentially important covariate for studies of asthma prevalence in Hawai'i. It has been observed that compared to other races in Hawai'i, NHOPI are more likely to live in a household with a smoker, are least likely to disallow smoking in the home, and are more likely to have ridden in a car during the past week with someone smoking (96). Finally, multivariable adjustments in this study did not a covariate representing socioeconomic status which is likely plays important and complex roles in asthma disparities in Hawai'i.

Another limitation of this study is possible information bias from race misclassification. For those who indicated that NHOPI best represented their race, 72% had indicated more than one census race category when initially asked about their race (with 41% specifying two races, and 30% specifying three). For those categorized in this study as Other race, when initially asked about their race 35% either didn't know or refused to answer, while 29% specified two races and 7% specified three races. In contrast, only 14% identifying best as White and 12% identifying best as Asian had initially indicated multiple race categories. The identities of the multiple racial groups that respondents specified were not included in the utilized BRFSS dataset, and thus the heterogeneous nature especially of the NHOPI, Asian, and other race groups in Hawai'i could not be addressed by this study. However, as noted for study 1, if racial misclassification in this study was non-differential then bias would likely be towards the null.

In summary, sociodemographic associations with adult asthma prevalence in Hawai'i were similar to those reported for other US populations, for the decade between 2001 and 2010. The burden of asthma in Hawai'i by population proportion has been highest among NHOPI, but

by absolute population numbers asthma has affected more Asians than any other racial group in Hawai'i. In addition, these findings demonstrate both socially- and racially-specific aspects to the epidemiology of asthma in Hawai'i, which may be important for state-level prevention programs such as the Hawai'i Asthma Plan (87). However, additional study is needed to better assess predictors of asthma prevalence in Hawai'i, especially among those less frequently surveyed such as NHOPI, young adults, men in certain sociodemographic strata, and those with current asthma.

STUDY 3: SOCIOECONOMIC STATUS AND ASTHMA PREVALENCE DISPARITIES AMONG NATIVE HAWAIIAN/OTHER PACIFIC ISLANDER, ASIAN, AND WHITE ADULTS IN THE UNITED STATES

INTRODUCTION

Investigations of asthma disparities among racial groups must account for interactions between race and SES. Otherwise, the roles of potentially modifiable social determinants of asthma will remain poorly understood and the goals for reductions in health inequities unmet.

Studies 1 and 2 demonstrated that for NHOPI in the continental US and Hawai‘i, during the decade between 2001-2010, asthma prevalence was distinctly high even after controlling for several common asthma risk factors. It has also been previously shown that asthma prevalence estimates remain elevated among NHOPI after controlling for SES as represented by education attainment (26, 53). However, such adjustment utilizing only main effects would insufficiently control for SES if the association between asthma and the SES measure varies by race. Moreover, it is unlikely that a single SES measure would sufficiently capture the multifarious and complex socioeconomic conditions that likely parallel racially-aligned disparities in asthma prevalence. Therefore, it remains unknown what and how socioeconomic factors may be involved in the unusually high asthma prevalence among US NHOPI. To begin to address this question for the continental US plus Hawai‘i, this investigation aimed to determine: 1) Whether there are socioeconomic gradients with asthma prevalence in the US that vary by race among NHOPI, Asians, Whites, and those of Other races, and 2) If NHOPI and other racial disparities in asthma prevalence persist, and/or how they change, after better controlling for differences in a variety of different SES measures.

METHODS

The data source, outcome variables, independent covariates, and statistical analyses were the same as for study 1, except that the data and analyses included BRFSS responses representative of socioeconomic status:

Independent Variables – Socioeconomics

Variables tenably representative of socioeconomics (97) that were consistently available in the multi-year BRFSS datasets were education attainment, household income category, household size (defined as the total number of adults and children in the household), employment status, and healthcare cost barrier as follows:

1) This investigation consolidated education responses into three categories, for proportionate sample sizes across categories (less than high school graduation; high school graduate (or some college); college graduate).
2) Categories of annual household income were combined into seven groups such that sample sizes were sufficient in the lowest income groups (< $15K, $15K – $24K, $25K – $34K, $35K – $49K, $50K – $74K, ≥ $75K, or missing).
3) To account for both income and household size, categories of annual individual income were created by dividing the midpoint of the response household income category by household size; individual income level was re-categorized into one of seven groupings (< $5K, $5K – $9K, $10K – $14K, $15K – $19K, $20K – $34K, ≥ $35K, or missing).
4) To help account for both possible monetary resource threshold effects and differences in cost of living across time and geography, household income and size were combined into a poverty income ratio (PIR). PIR was defined as the midpoint of the response household income category divided by the survey year's poverty guideline based on household size for either continental US or Hawai'i residents (published annually by the US Department of Health and Human Services). PIR categories were chosen to achieve sufficient sample sizes in the lowest and highest groupings (< 1, 1 – 1.9, 2 – 2.9, ≥ 3, missing).
5) To explore SES as a composite of both education and monetary resources, three groupings were created in the same manner as Karlamangla, et al. 2010 (98): Low SES (education less than high school graduation and PIR < 2); High SES (college graduate and PIR ≥ 2); and Mid SES (all other education and PIR combinations).
6) Employment status was classified as either: 1) Employed or self-employed; 2) Out of or unable to work (herein referred to as 'unemployed'); or 3) Other (including homemaker, student, or retired).
7) Lastly, having a cost barrier to healthcare utilization was assessed from the question, 'Was there a time during the last 12 months when you needed to see a doctor, but could not because of the cost?' (not asked in 2002; data for this variable were excluded from the 2001-2003 time period).

Frequencies of missing for education, employment, and healthcare cost barrier were less than 1%. In contrast, frequency of missing was high for household income (14%) and so missing was treated as a separate category for income, PIR, and composite SES. Table 3.1 summarizes the independent socioeconomic variables utilized by this study.

Table 3.1. Study independent socioeconomic variables from the Behavioral Risk Factor Surveillance System data, 2001-2010.

Variable	BRFSS Survey Question / Variable Definition	Response Categories Analyzed
Education	'What is the highest grade or year of school you completed?'	1) Less than high school graduation; 2) High school graduate (or some college); 3) College graduate
Household annual income	'Is your annual household income from all sources: Less than $10,000, $15,000, $20,000, $25,000, $35,000;, $50,000, or $75,000; $75,000 or more?'	1) <$15,000; 2) $15,000-$24,000; 3) $25,000-$34,000; 4) $35,000-$49,000; 5) $50,000-$74,000; 6) >=$75,000; 7) Missing (includes Don't know/Not sure; Refused)
Household size	The number of children ('How many children less than 18 years of age live in your household?') plus the number of adults in the household	Between 1 and ≥ 20
Individual annual income	The midpoint of the response household annual income category divided by the household size	1) <$5,000; 2) $5,000-$9,000; 3) $10,000-$14,000; 4) $15,000-$19,000; 5) $20,000-$34,000; 6) >=$35,000; 7) Missing (includes Don't know/Not sure; Refused)
Poverty income ratio (PIR)	The midpoint of the response household annual income category divided by the survey year's poverty guideline based on household size for either continental US or Hawai'i residents (published annually by the US Department of Health and Human Services)	1) PIR < 1; 2) PIR < 2; 3) PIR < 3; 4) PIR >=3; 5) Missing
Composite Socioeconomic Status (SES)	A composite category assignment based on both PIR and education	1) Low: Education less than high school graduation and PIR < 2; 2) High: College graduate and PIR ≥ 2; 3) Mid: All other education and PIR combinations
Employment	'Are you currently employed for wages, self-employed, out of work, a homemaker, a student, retired, or unable to work?'	1) Unemployed (includes out of work and unable to work); 2) Other (includes homemaker, student, and retired); 3) Employed or self-employed

Table 3.1. (Continued) Study independent socioeconomic variables from the Behavioral Risk Factor Surveillance System data, 2001-2010.

Variable	BRFSS Survey Question / Variable Definition	Response Categories Analyzed
Healthcare cost barrier	'Was there a time during the last 12 months when you needed to see a doctor, but could not because of the cost?'	1) Yes; 2) No Data not available for the 2001-2003 time period

To investigate whether associations between SES and asthma prevalence were modified by race, data were stratified by both sex and race. Adjusted lifetime and current asthma prevalence ratios for each of the seven different SES measures were obtained from multivariable logistic regression models fit within each sex/race subpopulation as described in study 1: Included covariates were categories for region, time period, age, BMI, smoking status, healthcare coverage, and healthcare provider (Table 2.1) and models were fit using the entire 2001-2010 dataset, with one exception: Due to missing data in the earliest time period, the associations between asthma and having a cost barrier to healthcare were derived from model fits that used the subset 2005-2010 dataset and additionally included a covariate for recent healthcare utilization. Linear trend tests were used to test for a gradient in asthma prevalence from low to high levels of ordinal SES indicators (i.e., education attainment, household and individual annual income, PIR, and composite SES; excluding missing). Given observed differences in the covariate distributions among SES groupings (data not shown) and known interactions between asthma risk factors and SES, plus known geographical heterogeneity in asthma prevalence, two-way interactions between the SES measure and each of the other covariates were tested together and in conjunction with the inclusion of two-way interactions between region. Final adjusted prevalence ratio estimates were derived from a model that retained significant interactions with SES and/or region.

Similarly, to investigate whether associations between race and asthma prevalence were modified by SES, data were stratified by both sex and levels of a socioeconomic indicator. In this manner, associations between race and asthma were directly adjusted for SES using stratification, instead of using interaction terms in a multivariable model; stratification was chosen for clarity and ease of interpretations. Due to observed interactions between race and a number of the covariates as described in studies 1 and 2 and the literature, two-way interactions between race and each of the other covariates were tested together and in conjunction with the inclusion of two-way interactions between region. Final adjusted prevalence ratio estimates were derived from a model that retained significant interactions with race and/or region.

As in study 1, the multivariable model was not run for current asthma among male NHOPI due to insufficient sample sizes, especially for the Midwest region.

RESULTS

Sample and Population Characteristics: SES By Race in the United States

The sociodemographic characteristics of the sample and US population were described in study 1 (Table 2.2). The sample and population characteristics for the covariates potentially representative of SES included in this study are shown in Table 3.2.

Compared with Whites and Asians of the same sex, NHOPI reported lack of healthcare coverage, unemployment, and a cost barrier to healthcare more frequently, and also had smaller proportions within the uppermost strata of the SES indicator variables of education, income, and composite SES (i.e., college graduate, individual annual income ≥ $35K, PIR ≥ 3, and high composite SES) (Tables 3.3 and 3.4). Those of Other race reported the lowermost levels of some SES measures (i.e., less than high school education, annual household income below $25K, PIR < 1, low composite SES, and a healthcare cost barrier). Missing income was least common among White men, followed by Asian men. Among women, missing income was least frequent among NHOPI, but no different among Whites, Asians, and those of Other race.

Both current and lifetime asthma prevalence were independently associated with each of the seven different SES indicator variables (e.g., education less than college graduate, lower or missing household and individual income levels, PIR levels below two or missing, composite SES below the highest level or missing, unemployment, and report of a healthcare cost barrier) (Table 3.2).

Table 3.2. Sample sizes, weighted population socioeconomic characteristics, crude asthma prevalence, and unadjusted socioeconomic associations with asthma - Behavioral Risk Factor Surveillance System data, 2001-2010.

United States			Lifetime asthma		Current asthma	
	Sample size	Population characteristics, % (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)
Education: <High school	310,146	11.7 (11.6,11.8)	13.4 (13.2,13.7)	1.1 (1.1,1.2)	9.5 (9.3,9.7)	1.3 (1.3,1.4)
Education: High school	1,755,664	55.9 (55.8,56.1)	12.9 (12.8,13.0)	1.1 (1.1,1.1)	8.3 (8.2,8.4)	1.2 (1.2,1.2)
Education: College	1,003,680	32.4 (32.2,32.5)	11.7 (11.6,11.8)	1.0 (ref)	7.1 (7.0,7.2)	1.0 (ref)
Household income: Missing	425,158	13.2 (13.2,13.3)	12.5 (12.2,12.7)	1.1 (1.1,1.1)	8.1 (7.9,8.2)	1.2 (1.2,1.2)
Household income: <$15K	304,512	9.1 (9.0,9.1)	16.3 (16.0,16.6)	1.4 (1.4,1.4)	12.1 (11.9,12.3)	1.8 (1.7,1.8)
Household income: <$25K	474,220	14.3 (14.2,14.4)	13.6 (13.4,13.9)	1.2 (1.2,1.2)	9.3 (9.1,9.4)	1.4 (1.3,1.4)
Household income: <$35K	350,338	10.8 (10.7,10.8)	12.2 (12.0,12.5)	1.1 (1.0,1.1)	7.9 (7.7,8.1)	1.2 (1.1,1.2)
Household income: <$50K	438,412	13.7 (13.7,13.8)	12.0 (11.8,12.2)	1.0 (1.0,1.1)	7.4 (7.3,7.6)	1.1 (1.1,1.1)
Household income: <$75K	444,277	14.8 (14.7,14.9)	11.8 (11.6,12.0)	1.0 (1.0,1.0)	7.2 (7.0,7.3)	1.1 (1.0,1.1)
Household income: ≥$75K	641,587	24.1 (24.0,24.2)	11.6 (11.4,11.7)	1.0 (ref)	6.7 (6.6,6.9)	1.0 (ref)
Individual income: Missing	427,390	13.3 (13.2,13.4)	12.5 (12.3,12.7)	1.1 (1.1,1.1)	8.1 (7.9,8.2)	1.2 (1.2,1.2)
Individual income: <$5K	166,923	9.8 (9.7,9.9)	14.7 (14.3,15.0)	1.3 (1.3,1.3)	10.3 (10.0,10.6)	1.5 (1.5,1.6)
Individual income: <$10K	360,973	13.5 (13.4,13.6)	14.3 (14.1,14.5)	1.3 (1.3,1.3)	9.6 (9.4,9.8)	1.4 (1.4,1.5)
Individual income: <$15K	394,538	13.7 (13.6,13.7)	12.9 (12.7,13.1)	1.2 (1.1,1.2)	8.2 (8.0,8.3)	1.2 (1.2,1.3)
Individual income: <$20K	470,393	17.0 (16.9,17.1)	11.9 (11.7,12.1)	1.1 (1.0,1.1)	7.3 (7.2,7.5)	1.1 (1.1,1.1)
Individual income: <$35K	747,835	20.8 (20.7,20.9)	11.7 (11.6,11.8)	1.0 (1.0,1.1)	7.3 (7.1,7.4)	1.1 (1.1,1.1)
Individual income: ≥$35K	510,452	12.0 (11.9,12.0)	11.2 (11.0,11.3)	1.0 (ref)	6.7 (6.6,6.8)	1.0 (ref)

Table 3.2. (Continued) Sample sizes, weighted population socioeconomic characteristics, crude asthma prevalence, and unadjusted socioeconomic associations with asthma - Behavioral Risk Factor Surveillance System data, 2001-2010.

United States			Lifetime asthma		Current asthma	
	Sample size	Population characteristics, % (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)
PIR: Missing	427,406	13.3 (13.2,13.4)	12.5 (12.3,12.7)	1.1 (1.1,1.1)	8.1 (7.9,8.2)	1.2 (1.1,1.2)
PIR: <1	276,862	11.6 (11.5,11.7)	15.5 (15.2,15.8)	1.3 (1.3,1.4)	11.1 (10.9,11.3)	1.6 (1.6,1.6)
PIR: <2	554,475	18.0 (17.9,18.1)	13.6 (13.4,13.8)	1.2 (1.2,1.2)	9.0 (8.8,9.1)	1.3 (1.3,1.3)
PIR: <3	556,793	16.7 (16.6,16.8)	12.1 (12.0,12.3)	1.1 (1.0,1.1)	7.6 (7.5,7.7)	1.1 (1.1,1.1)
PIR: >=3	1,262,968	40.3 (40.2,40.4)	11.5 (11.4,11.6)	1.0 (ref)	6.9 (6.8,7.0)	1.0 (ref)
Composite SES: Missing	429,786	13.4 (13.3,13.5)	12.5 (12.2,12.7)	1.1 (1.1,1.1)	8.1 (7.9,8.2)	1.2 (1.1,1.2)
Composite SES: Low	177,454	7.2 (7.2,7.3)	13.3 (13.0,13.6)	1.1 (1.1,1.2)	9.6 (9.4,9.9)	1.4 (1.4,1.4)
Composite SES: Mid	1,672,062	53.7 (53.6,53.8)	13.0 (12.9,13.1)	1.1 (1.1,1.1)	8.4 (8.3,8.4)	1.2 (1.2,1.2)
Composite SES: High	799,202	25.6 (25.5,25.7)	11.6 (11.4,11.7)	1.0 (ref)	6.9 (6.8,7.0)	1.0 (ref)
Employment: Unemployed	330,188	10.9 (10.9,11.0)	20.2 (19.9,20.5)	1.8 (1.7,1.8)	14.9 (14.7,15.2)	2.2 (2.1,2.2)
Employment: Other	1,067,557	28.5 (28.4,28.6)	11.9 (11.8,12.0)	1.0 (1.0,1.0)	7.9 (7.8,8.0)	1.1 (1.1,1.2)
Employment: Employed	1,669,636	60.5 (60.4,60.6)	11.5 (11.4,11.6)	1.0 (ref)	6.9 (6.8,7.0)	1.0 (ref)
Healthcare cost barrier: Yes	277,396	14.0 (13.9,14.1)	18.3 (18.0,18.6)	1.5 (1.5,1.5)	12.4 (12.1,12.6)	1.6 (1.6,1.7)
Healthcare cost barrier: No	2,100,413	86.0 (85.9,86.1)	12.2 (12.1,12.3)	1.0 (ref)	7.7 (7.6,7.7)	1.0 (ref)

Table 3.3. United States, by Native Hawaiian/Other Pacific Islander (NHOPI) or Asian race – Sample sizes and socioeconomic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI		Asian	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Education: <High school	1,126	11.0 (9.5,12.7)	2,897	4.9 (4.5,5.4)
Education: High school	8,302	59.8 (57.5,62.1)	22,805	33.7 (32.8,34.6)
Education: College	3,011	29.2 (27.2,31.3)	31,376	61.4 (60.5,62.3)
Household income: Missing	1,617	12.9 (11.4,14.7)	8,581	13.0 (12.4,13.6)
Household income: <$15K	1,380	9.8 (8.4,11.4)	3,849	7.9 (7.3,8.4)
Household income: <$25K	2,102	15.2 (13.7,16.9)	6,025	9.7 (9.2,10.3)
Household income: <$35K	1,511	11.9 (10.5,13.6)	5,283	7.8 (7.3,8.3)
Household income: <$50K	1,904	14.0 (12.4,15.7)	7,464	11.8 (11.2,12.4)
Household income: <$75K	1,753	13.8 (12.3,15.3)	8,628	14.5 (13.9,15.1)
Household income: ≥$75K	2,208	22.4 (20.5,24.4)	17,567	35.4 (34.6,36.3)
Individual income: Missing	1,628	13.0 (11.5,14.8)	8,633	13.1 (12.5,13.7)
Individual income: <$5K	1,539	16.6 (14.8,18.6)	3,369	10.0 (9.4,10.7)
Individual income: <$10K	2,222	18.3 (16.5,20.4)	6,164	12.3 (11.6,12.9)
Individual income: <$15K	1,961	14.6 (13.0,16.2)	6,963	13.1 (12.4,13.7)
Individual income: <$20K	1,791	15.9 (14.3,17.5)	10,331	21.3 (20.6,22.1)
Individual income: <$35K	2,127	14.4 (13.0,16.0)	12,741	19.1 (18.5,19.8)
Individual income: ≥$35K	1,207	7.2 (6.3,8.1)	9,196	11.1 (10.7,11.6)
PIR: Missing	1,631	13.2 (11.6,15.0)	8,634	13.1 (12.5,13.7)
PIR: <1	2,068	17.5 (15.7,19.5)	4,886	11.4 (10.7,12.0)
PIR: <2	3,005	21.3 (19.4,23.3)	9,058	14.5 (13.9,15.2)
PIR: <3	2,397	17.1 (15.4,18.9)	9,727	15.8 (15.2,16.5)
PIR: >=3	3,374	30.9 (28.8,33.0)	25,092	45.2 (44.3,46.1)
Composite SES: Missing	1,638	13.4 (11.8,15.1)	8,711	13.2 (12.6,13.8)
Composite SES: Low	711	7.5 (6.1,9.0)	1,619	3.0 (2.7,3.4)
Composite SES: Mid	7,939	58.4 (56.1,60.7)	23,459	38.7 (37.8,39.6)
Composite SES: High	2,187	20.7 (19.0,22.5)	23,608	45.1 (44.2,46.0)
Employment: Unemployed	1,557	14.9 (13.2,16.7)	3,782	8.2 (7.7,8.7)
Employment: Other	3,129	21.0 (19.3,22.8)	17,073	25.5 (24.7,26.3)
Employment: Employed	7,733	64.1 (61.9,66.3)	36,236	66.3 (65.5,67.2)
Healthcare cost barrier: Yes	1,284	17.0 (15.1,19.1)	3,628	11.2 (10.5,12.0)
Healthcare cost barrier: No	7,879	83.0 (80.9,84.9)	38,842	88.8 (88.0,89.5)

Table 3.4. United States, by White or Other race – Sample sizes and socioeconomic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White		Other	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Education: <High school	220,447	10.0 (9.9,10.1)	85,676	20.1 (19.8,20.4)
Education: High school	1,481,666	56.2 (56.1,56.3)	242,891	58.7 (58.3,59.0)
Education: College	877,248	33.8 (33.7,33.9)	92,045	21.3 (21.0,21.5)
Household income: Missing	349,296	12.8 (12.7,12.9)	65,664	15.2 (14.9,15.4)
Household income: <$15K	222,374	7.7 (7.6,7.8)	76,909	15.2 (15.0,15.4)
Household income: <$25K	372,229	12.8 (12.7,12.9)	93,864	21.4 (21.1,21.6)
Household income: <$35K	289,986	10.4 (10.3,10.5)	53,558	12.7 (12.5,13.0)
Household income: <$50K	378,270	14.1 (14.0,14.1)	50,774	12.7 (12.5,12.9)
Household income: <$75K	394,050	15.8 (15.7,15.9)	39,846	10.4 (10.2,10.6)
Household income: ≥$75K	579,159	26.4 (26.3,26.5)	42,653	12.5 (12.3,12.7)
Individual income: Missing	350,977	12.9 (12.8,13.0)	66,152	15.3 (15.0,15.5)
Individual income: <$5K	101,296	7.5 (7.4,7.6)	60,719	19.2 (18.9,19.4)
Individual income: <$10K	269,727	12.0 (11.9,12.1)	82,860	20.0 (19.7,20.3)
Individual income: <$15K	328,427	13.6 (13.6,13.7)	57,187	13.9 (13.7,14.1)
Individual income: <$20K	411,325	18.1 (18.1,18.2)	46,946	11.4 (11.2,11.6)
Individual income: <$35K	663,871	22.6 (22.5,22.7)	69,096	13.7 (13.5,13.9)
Individual income: ≥$35K	459,741	13.3 (13.2,13.3)	40,308	6.6 (6.5,6.7)
PIR: Missing	350,982	12.9 (12.8,13.0)	66,159	15.3 (15.0,15.5)
PIR: <1	183,536	9.2 (9.1,9.3)	86,372	22.0 (21.7,22.3)
PIR: <2	438,137	16.7 (16.6,16.8)	104,275	24.3 (24.0,24.5)
PIR: <3	479,590	17.2 (17.1,17.3)	65,079	14.8 (14.6,15.0)
PIR: >=3	1,133,119	44.0 (43.9,44.2)	101,383	23.7 (23.4,23.9)
Composite SES: Missing	352,604	12.9 (12.9,13.0)	66,833	15.4 (15.2,15.7)
Composite SES: Low	120,078	6.0 (5.9,6.1)	55,046	13.3 (13.1,13.5)
Composite SES: Mid	1,403,379	53.6 (53.5,53.8)	237,285	56.5 (56.2,56.8)
Composite SES: High	709,303	27.4 (27.3,27.5)	64,104	14.8 (14.6,15.0)
Employment: Unemployed	243,387	9.5 (9.4,9.6)	81,462	17.6 (17.3,17.8)
Employment: Other	933,392	30.0 (29.9,30.1)	113,963	22.9 (22.7,23.2)
Employment: Employed	1,400,807	60.5 (60.4,60.6)	224,860	59.5 (59.2,59.8)
Healthcare cost barrier: Yes	206,648	12.3 (12.2,12.4)	65,836	21.8 (21.5,22.1)
Healthcare cost barrier: No	1,793,108	87.7 (87.6,87.8)	260,584	78.2 (77.9,78.5)

Socioeconomic Associations with Asthma Prevalence By Sex and Race in the United States, After Control for Sociodemographics

When stratified by both sex and race, consistent inverse gradients between adjusted asthma prevalence and ordinal SES measures were demonstrated only among Whites and women of Other race, with few exceptions (Tables 3.5 thru 3.12). Specifically, there were significant linear trends of decreasing adjusted asthma prevalence from the lowest socioeconomic stratum to the highest among Whites (Tables 3.9 and 3.10) and those of Other race (Tables 3.11 and 3.12), except among Other race men reporting an asthma ever-diagnosis. For example, current asthma among White women was 80% more common among those in the lowest level of household income than in the highest, after controlling for sociodemographics. In addition, Whites and those of Other race reported asthma more often when also reporting unemployment or a healthcare cost barrier, compared to those employed or without a cost barrier, respectively. For instance, adjusted current asthma among White and Other race men was 2.1 times more common among the unemployed than the employed.

Among Whites and those of Other race, differences in asthma prevalence between low versus high measures of SES were often greater for current than for lifetime asthma (Tables 3.9 thru 3.12). In addition, prevalence estimates meaningfully changed after controlling for other covariates only among Whites and Other race women. Specifically, multivariable adjustment *increased* comparative differences in asthma prevalence by SES level, except for unemployed versus employed White women. For example, crude current asthma prevalence among women of low compared to high composite SES was PR=1.4 (1.3,1.5), which changed to aPR=1.6 (1.5,1.7) after adjustment. Similarly, crude current asthma prevalence among men of lowest compared to highest household income was PR=1.8 (1.7,1.9), which changed to aPR=2.1 (1.9,2.2) after adjustment.

The magnitude of elevated within-race adjusted asthma prevalence among lower SES levels (compared to the uppermost level) was in some instances greater for Whites (Tables 3.9 and 3.10) than for those of Other race (Tables 3.11 and 3.12). For example, lifetime asthma prevalence was elevated more for White than Other race women reporting the lowest levels of annual household or individual income, lower levels of PIR, low composite SES, unemployment, and having a healthcare cost barrier. Men of White race and PIR < 1 were 40% more likely to report lifetime asthma compared to those with PIR ≥ 3, whereas for men of Other race the adjusted association between PIR < 1 and lifetime asthma prevalence was less (aPR=1.1). Similarly, the magnitudes of the relationship between lower household income levels (categories less than $35K) and elevated asthma prevalence were also somewhat stronger for White than for Other race men.

In contrast to lower SES, the degree to which within-race asthma prevalence was elevated among middle/upper socioeconomic levels (compared to the uppermost level) was often greater for those of Other race than for Whites (Tables 3.9 thru 3.12). For instance, for those of Other race a report of current asthma was 30% more frequent among mid-level composite SES than for high, whereas prevalence was only 10% more frequent for mid-SES Whites. Similarly, the magnitudes of adjusted prevalence ratios were greater for Other race men than for White men within the mid- and upper-level SES categories of having a high school education and annual individual income < $35K.

For NHOPI women, like White and Other race women, point estimates of adjusted asthma prevalence were elevated among those reporting the lowest levels of some SES measures compared to the highest, especially for current asthma, although these associations were significant only for employment and income (Table 3.5). For example, after controlling for covariates among NHOPI women, current asthma was 80% more prevalent among those with an unemployed status compared to employed and was nearly twice as likely at the lowest level of household income compared to the highest. Asthma prevalence was marginally higher for NHOPI having a cost barrier to healthcare compared to not having this healthcare barrier, including after adjustment for recent healthcare utilization. For NHOPI men, there was reduced power to detect differences in lifetime asthma prevalence for low versus high levels of SES, and prevalence could not be estimated for current asthma due to small sample sizes (Table 3.6). However, both crude and adjusted lifetime asthma prevalence were highest among NHOPI men at mid-levels of household income, while highest lifetime asthma prevalence estimates at mid-levels of education and composite SES were marginally significant. Similarly, crude current asthma prevalence was highest among NHOPI men at mid-levels of education, individual income, and reporting an unemployed status. In contrast to men, NHOPI women had somewhat *less* asthma at middle levels of some SES indicators, with higher asthma burden at lowest and highest SES levels. For example, lifetime asthma was less common among NHOPI women at PIR < 2 than at the highest level of income.

Asians in middle levels of individual income and/or PIR also often had lower asthma prevalence estimates compared to those in lower or upper levels, although associations were not always significant (Tables 3.6 and 3.7). However, current asthma among Asians was elevated for unemployed compared to employed, and Asian women with a healthcare cost barrier had elevated asthma prevalence compared to those without a cost barrier.

Among race/sex groups not reporting household income, both lifetime and current asthma prevalence estimates were elevated compared to those reporting the highest income, except among Asian women. Asthma associations with missing income were especially substantial for NHOPI men who also reported an asthma ever-diagnosis.

Table 3.5. United States, Native Hawaiian/Other Pacific Islander (NHOPI) women – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	NHOPI Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	19.1 (11.8,29.2)	1.2 (0.7,2.0)	1.2 (0.8,2.0)	12.6 (6.9,21.8)	1.4 (0.7,2.8)	1.3 (0.8,2.4)
Education: High school	18.3 (15.7,21.3)	1.2 (0.9,1.5)	1.0 (0.8,1.3)	12.1 (10.0,14.7)	1.4 (1.0,2.0)	1.1 (0.8,1.5)
Education: College	15.9 (12.5,20.0)	1.0 (ref)	1.0 (ref)	8.8 (6.4,12.0)	1.0 (ref)	1.0 (ref)
Household income: Missing	15.8 (11.2,21.8)	0.9 (0.6,1.5)	1.2 (0.8,1.9)	8.8 (5.7,13.5)	0.8 (0.5,1.5)	0.9 (0.5,1.6)
Household income: <$15K	24.4 (17.0,33.5)	1.4 (0.9,2.3)	1.5 (1.0,2.3)	18.2 (11.8,27.0)	1.7 (1.0,3.1)	1.9 (1.1,3.2)
Household income: <$25K	17.4 (12.6,23.6)	1.0 (0.7,1.6)	1.0 (0.6,1.5)	13.5 (9.2,19.5)	1.3 (0.7,2.2)	1.2 (0.7,2.0)
Household income: <$35K	14.3 (10.0,20.0)	0.8 (0.5,1.4)	0.8 (0.5,1.3)	8.7 (5.9,12.6)	0.8 (0.5,1.4)	0.8 (0.5,1.4)
Household income: <$50K	14.7 (10.5,20.3)	0.9 (0.6,1.4)	0.9 (0.6,1.3)	9.4 (6.0,14.6)	0.9 (0.5,1.6)	0.9 (0.5,1.5)
Household income: <$75K	21.3 (15.8,28.1)	1.3 (0.8,1.9)	1.3 (0.9,1.8)	10.1 (6.9,14.7)	1.0 (0.6,1.7)	0.9 (0.5,1.5)
Household income: ≥$75K	16.8 (12.3,22.7)	1.0 (ref)	1.0 (ref)	10.5 (7.0,15.5)	1.0 (ref)	1.0 (ref)
Individual income: Missing	15.8 (11.2,21.9)	1.2 (0.8,2.0)	1.9 (1.2,3.1)	8.8 (5.7,13.5)	1.3 (0.7,2.4)	0.9 (0.5,1.6)
Individual income: <$5K	20.7 (15.1,27.6)	1.6 (1.0,2.6)	2.1 (1.4,3.3)	16.0 (11.0,22.7)	2.3 (1.3,4.2)	1.3 (0.7,2.3)
Individual income: <$10K	14.3 (10.1,19.8)	1.1 (0.7,1.8)	1.2 (0.8,1.9)	10.4 (6.8,15.6)	1.5 (0.8,2.9)	0.8 (0.4,1.4)
Individual income: <$15K	15.9 (11.2,22.1)	1.3 (0.8,2.0)	1.5 (1.0,2.3)	10.2 (6.3,16.1)	1.5 (0.8,2.9)	0.8 (0.4,1.4)
Individual income: <$20K	21.1 (15.6,27.8)	1.7 (1.1,2.6)	2.2 (1.4,3.3)	10.7 (7.6,14.9)	1.6 (0.9,2.8)	0.9 (0.5,1.5)
Individual income: <$35K	19.3 (14.4,25.3)	1.5 (1.0,2.4)	2.1 (1.4,3.2)	11.6 (8.0,16.5)	1.7 (0.9,3.1)	1.1 (0.6,1.9)
Individual income: ≥$35K	12.7 (8.9,17.7)	1.0 (ref)	1.0 (ref)	6.8 (4.2,10.8)	1.0 (ref)	1.0 (ref)

Table 3.5. (Continued) United States, Native Hawaiian/Other Pacific Islander (NHOPI) women – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	NHOPI Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	15.8 (11.2,21.9)	0.8 (0.6,1.3)	1.0 (0.7,1.5)	8.8 (5.7,13.5)	0.8 (0.5,1.4)	0.7 (0.4,1.3)
PIR: <1	22.5 (17.0,29.2)	1.2 (0.8,1.7)	1.1 (0.8,1.6)	16.9 (12.0,23.1)	1.5 (1.0,2.4)	1.4 (0.9,2.2)
PIR: <2	13.6 (10.1,18.0)	0.7 (0.5,1.0)	0.6 (0.4,1.0)	9.9 (6.8,14.2)	0.9 (0.5,1.4)	0.8 (0.5,1.3)
PIR: <3	16.0 (12.1,21.0)	0.8 (0.6,1.2)	0.8 (0.5,1.1)	8.6 (6.3,11.6)	0.8 (0.5,1.2)	0.6 (0.4,1.0)
PIR: >=3	19.0 (15.0,23.8)	1.0 (ref)	1.0 (ref)	11.1 (8.1,15.1)	1.0 (ref)	1.0 (ref)
Composite SES: Missing	15.8 (11.2,21.8)	1.0 (0.6,1.5)	1.2 (0.8,2.0)	8.8 (5.6,13.4)	1.0 (0.6,1.7)	1.0 (0.5,1.8)
Composite SES: Low	17.3 (9.3,29.7)	1.1 (0.6,2.1)	1.1 (0.7,2.0)	13.5 (6.5,25.7)	1.5 (0.7,3.3)	1.7 (1.0,3.1)
Composite SES: Mid	18.6 (15.9,21.8)	1.2 (0.9,1.6)	1.0 (0.7,1.4)	12.3 (10.0,15.0)	1.4 (1.0,2.1)	1.2 (0.8,1.7)
Composite SES: High	15.9 (12.2,20.5)	1.0 (ref)	1.0 (ref)	8.7 (6.2,12.1)	1.0 (ref)	1.0 (ref)
Employment: Unemployed	23.5 (17.1,31.4)	1.4 (1.0,2.0)	1.5 (1.0,2.0)	18.3 (12.6,25.9)	1.7 (1.1,2.6)	1.8 (1.2,2.7)
Employment: Other	16.3 (12.7,20.7)	1.0 (0.7,1.3)	1.1 (0.8,1.5)	8.5 (6.2,11.5)	0.8 (0.5,1.1)	0.9 (0.6,1.3)
Employment: Employed	16.9 (14.3,19.9)	1.0 (ref)	1.0 (ref)	10.7 (8.6,13.3)	1.0 (ref)	1.0 (ref)
Healthcare cost barrier: Yes	20.5 (15.0,27.4)	1.2 (0.9,1.7)	1.3 (0.9,1.9)	12.8 (8.7,18.5)	1.3 (0.8,1.9)	1.2 (0.8,1.9)
Healthcare cost barrier: No	17.2 (14.8,19.9)	1.0 (ref)	1.0 (ref)	10.2 (8.5,12.1)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, an indicator of socioeconomic status (i.e., education attainment, annual household income, annual individual income, PIR, composite SES, employment status, or healthcare cost barrier), plus any significant interactions between a covariate, region, and/or socioeconomic status.

Table 3.6. United States, Native Hawaiian/Other Pacific Islander (NHOPI) men – Lifetime asthma and current prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	NHOPI Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	12.4 (7.1,20.8)	1.0 (0.6,1.9)	0.9 (0.5,1.6)	6.2 (3.1,12.1)	1.1 (0.5,2.5)	NA
Education: High school	18.1 (14.5,22.3)	1.5 (1.0,2.2)	1.3 (0.9,1.9)	7.3 (5.6,9.5)	1.3 (0.8,2.2)	NA
Education: College	12.0 (8.8,16.1)	1.0 (ref)	1.0 (ref)	5.6 (3.6,8.7)	1.0 (ref)	NA
Household income: Missing	21.0 (11.5,35.3)	1.6 (0.8,3.0)	1.5 (1.0,2.5)	8.1 (4.6,13.7)	1.3 (0.7,2.7)	NA
Household income: <$15K	13.3 (7.6,22.2)	1.0 (0.5,1.8)	1.6 (0.9,2.6)	8.6 (4.3,16.2)	1.4 (0.6,3.1)	NA
Household income: <$25K	17.3 (12.0,24.1)	1.3 (0.8,2.0)	1.3 (0.8,2.1)	7.0 (4.3,11.2)	1.2 (0.6,2.2)	NA
Household income: <$35K	18.1 (11.5,27.5)	1.4 (0.8,2.3)	1.3 (0.9,2.1)	4.9 (2.3,10.1)	0.8 (0.3,1.9)	NA
Household income: <$50K	14.7 (9.1,22.9)	1.1 (0.6,1.9)	0.9 (0.6,1.5)	7.7 (4.3,13.3)	1.3 (0.6,2.6)	NA
Household income: <$75K	13.4 (9.0,19.5)	1.0 (0.6,1.6)	1.1 (0.7,1.7)	6.1 (3.1,11.8)	1.0 (0.5,2.3)	NA
Household income: ≥$75K	13.4 (9.8,18.0)	1.0 (ref)	1.0 (ref)	6.0 (3.9,9.2)	1.0 (ref)	NA
Individual income: Missing	21.9 (12.3,35.8)	1.8 (0.9,3.6)	2.1 (1.1,3.7)	9.1 (5.3,15.2)	1.7 (0.7,4.0)	NA
Individual income: <$5K	13.7 (8.7,20.8)	1.1 (0.6,2.1)	1.1 (0.6,2.1)	6.2 (3.4,11.2)	1.1 (0.4,2.9)	NA
Individual income: <$10K	14.7 (10.3,20.7)	1.2 (0.7,2.1)	1.3 (0.7,2.4)	6.4 (3.8,10.5)	1.2 (0.5,2.8)	NA
Individual income: <$15K	14.7 (9.9,21.3)	1.2 (0.7,2.2)	1.2 (0.7,2.3)	8.2 (4.7,14.0)	1.5 (0.6,3.7)	NA
Individual income: <$20K	15.7 (10.7,22.5)	1.3 (0.7,2.3)	1.3 (0.7,2.3)	6.3 (3.5,10.9)	1.1 (0.5,2.8)	NA
Individual income: <$35K	16.5 (10.9,24.2)	1.4 (0.8,2.5)	1.2 (0.7,2.3)	5.8 (3.4,9.7)	1.0 (0.4,2.5)	NA
Individual income: ≥$35K	12.0 (7.8,18.2)	1.0 (ref)	1.0 (ref)	5.5 (2.7,11.1)	1.0 (ref)	NA

Table 3.6. (Continued) United States, Native Hawaiian/Other Pacific Islander (NHOPI) men – Lifetime asthma and current prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	NHOPI Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	22.4 (12.9,36.0)	1.5 (0.9,2.8)	1.6 (1.1,2.5)	9.0 (5.2,15.0)	1.6 (0.8,3.0)	NA
PIR: <1	14.4 (9.6,20.9)	1.0 (0.6,1.6)	1.1 (0.7,1.7)	7.8 (4.7,12.5)	1.4 (0.7,2.5)	NA
PIR: <2	14.4 (10.3,19.7)	1.0 (0.7,1.5)	1.0 (0.7,1.5)	6.1 (3.8,9.7)	1.1 (0.6,2.0)	NA
PIR: <3	15.6 (10.4,22.8)	1.1 (0.7,1.7)	1.1 (0.7,1.7)	7.2 (3.9,13.0)	1.3 (0.6,2.6)	NA
PIR: >=3	14.5 (11.0,18.8)	1.0 (ref)	1.0 (ref)	5.6 (3.9,8.1)	1.0 (ref)	NA
Composite SES: Missing	22.0 (12.7,35.4)	1.9 (1.0,3.6)	1.7 (1.1,2.8)	8.8 (5.1,14.8)	1.5 (0.7,3.2)	NA
Composite SES: Low	8.6 (4.2,16.8)	0.7 (0.3,1.6)	0.7 (0.3,1.4)	7.4 (3.3,15.9)	1.3 (0.5,3.3)	NA
Composite SES: Mid	16.6 (13.6,20.0)	1.4 (1.0,2.1)	1.3 (0.9,1.9)	6.5 (5.0,8.6)	1.1 (0.6,2.0)	NA
Composite SES: High	11.5 (8.1,16.1)	1.0 (ref)	1.0 (ref)	5.9 (3.4,9.9)	1.0 (ref)	NA
Employment: Unemployed	17.0 (11.6,24.1)	1.1 (0.7,1.6)	1.1 (0.8,1.7)	10.6 (6.9,16.1)	1.8 (1.1,2.9)	NA
Employment: Other	13.8 (9.6,19.5)	0.9 (0.6,1.3)	1.0 (0.6,1.6)	6.2 (3.8,10.0)	1.0 (0.6,1.8)	NA
Employment: Employed	16.0 (12.8,19.8)	1.0 (ref)	1.0 (ref)	6.0 (4.5,8.0)	1.0 (ref)	NA
Healthcare cost barrier: Yes	17.4 (11.9,24.9)	1.0 (0.7,1.6)	1.0 (0.7,1.6)	9.3 (5.7,14.8)	1.2 (0.7,2.1)	NA
Healthcare cost barrier: No	17.3 (13.7,21.6)	1.0 (ref)	1.0 (ref)	7.7 (5.8,10.0)	1.0 (ref)	NA

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, an indicator of socioeconomic status (i.e., education attainment, annual household income, annual individual income, PIR, composite SES, employment status, or healthcare cost barrier), plus any significant interactions between a covariate, region, and/or socioeconomic status.

Table 3.7. United States, Asian women – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	Asian Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	8.8 (6.4,11.9)	1.1 (0.8,1.5)	0.9 (0.6,1.2)	5.3 (3.7,7.3)	1.2 (0.8,1.7)	1.0 (0.7,1.4)
Education: High school	9.6 (8.4,10.9)	1.1 (1.0,1.3)	1.0 (0.9,1.2)	5.2 (4.4,6.1)	1.2 (0.9,1.4)	1.1 (0.9,1.4)
Education: College	8.3 (7.6,9.1)	1.0 (ref)	1.0 (ref)	4.5 (4.0,5.1)	1.0 (ref)	1.0 (ref)
Household income: Missing	7.8 (6.5,9.4)	0.8 (0.7,1.1)	1.0 (0.8,1.3)	3.9 (3.1,4.9)	0.8 (0.6,1.0)	0.9 (0.7,1.2)
Household income: <$15K	8.6 (6.6,11.0)	0.9 (0.7,1.2)	0.9 (0.7,1.2)	5.8 (4.2,8.0)	1.1 (0.8,1.6)	1.2 (0.8,1.7)
Household income: <$25K	6.9 (5.4,8.7)	0.7 (0.6,1.0)	0.8 (0.6,1.0)	3.9 (2.8,5.3)	0.8 (0.5,1.1)	0.8 (0.6,1.1)
Household income: <$35K	8.2 (6.3,10.6)	0.9 (0.7,1.2)	0.9 (0.6,1.2)	4.6 (3.4,6.4)	0.9 (0.6,1.3)	0.9 (0.6,1.3)
Household income: <$50K	7.8 (6.3,9.5)	0.8 (0.7,1.1)	0.9 (0.7,1.1)	3.9 (3.0,5.0)	0.8 (0.6,1.0)	0.8 (0.6,1.1)
Household income: <$75K	11.4 (9.5,13.6)	1.2 (1.0,1.5)	1.2 (0.9,1.5)	5.8 (4.5,7.5)	1.1 (0.8,1.5)	1.1 (0.8,1.5)
Household income: ≥$75K	9.2 (8.1,10.5)	1.0 (ref)	1.0 (ref)	5.1 (4.3,6.0)	1.0 (ref)	1.0 (ref)
Individual income: Missing	7.9 (6.6,9.5)	0.7 (0.6,1.0)	0.9 (0.7,1.1)	3.9 (3.1,4.9)	0.6 (0.5,0.9)	0.7 (0.5,1.0)
Individual income: <$5K	7.8 (6.0,10.2)	0.7 (0.5,1.0)	0.7 (0.5,1.0)	5.5 (3.9,7.7)	0.9 (0.6,1.3)	0.9 (0.6,1.3)
Individual income: <$10K	8.8 (6.7,11.4)	0.8 (0.6,1.1)	0.9 (0.7,1.2)	4.0 (3.1,5.1)	0.6 (0.5,0.9)	0.7 (0.5,0.9)
Individual income: <$15K	7.4 (6.0,9.0)	0.7 (0.5,0.9)	0.7 (0.5,0.9)	3.9 (2.9,5.2)	0.6 (0.4,0.9)	0.6 (0.4,0.9)
Individual income: <$20K	8.8 (7.4,10.5)	0.8 (0.7,1.1)	0.8 (0.6,1.0)	5.0 (3.9,6.3)	0.8 (0.6,1.1)	0.8 (0.5,1.0)
Individual income: <$35K	10.0 (8.6,11.5)	0.9 (0.8,1.2)	0.9 (0.7,1.1)	5.3 (4.3,6.4)	0.9 (0.6,1.1)	0.8 (0.6,1.1)
Individual income: ≥$35K	10.5 (9.0,12.4)	1.0 (ref)	1.0 (ref)	6.2 (4.9,7.7)	1.0 (ref)	1.0 (ref)

Table 3.7. (Continued) United States, Asian women – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	Asian Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	7.9 (6.6,9.5)	0.8 (0.7,1.0)	1.0 (0.8,1.3)	4.0 (3.2,5.0)	0.8 (0.6,1.0)	0.9 (0.7,1.2)
PIR: <1	7.5 (5.9,9.5)	0.8 (0.6,1.0)	0.8 (0.6,1.0)	5.2 (3.8,7.1)	1.0 (0.7,1.4)	1.0 (0.7,1.4)
PIR: <2	8.5 (6.9,10.3)	0.9 (0.7,1.1)	0.9 (0.7,1.2)	4.3 (3.4,5.5)	0.8 (0.6,1.1)	0.9 (0.6,1.2)
PIR: <3	8.9 (7.2,10.9)	0.9 (0.7,1.2)	0.9 (0.7,1.2)	4.5 (3.5,5.7)	0.9 (0.6,1.1)	0.9 (0.7,1.2)
PIR: >=3	9.5 (8.5,10.5)	1.0 (ref)	1.0 (ref)	5.2 (4.5,6.0)	1.0 (ref)	1.0 (ref)
Composite SES: Missing	7.9 (6.6,9.4)	0.9 (0.8,1.1)	1.1 (0.8,1.3)	4.0 (3.2,5.0)	0.9 (0.7,1.1)	1.0 (0.7,1.3)
Composite SES: Low	9.4 (6.2,14.0)	1.1 (0.7,1.7)	0.9 (0.6,1.5)	5.9 (3.9,9.0)	1.3 (0.8,2.0)	1.1 (0.7,1.7)
Composite SES: Mid	9.3 (8.2,10.5)	1.1 (0.9,1.3)	1.0 (0.9,1.2)	5.2 (4.4,6.1)	1.1 (0.9,1.4)	1.1 (0.9,1.4)
Composite SES: High	8.5 (7.7,9.5)	1.0 (ref)	1.0 (ref)	4.6 (4.0,5.3)	1.0 (ref)	1.0 (ref)
Employment: Unemployed	8.5 (6.7,10.7)	0.9 (0.7,1.2)	1.0 (0.8,1.4)	5.3 (3.9,7.1)	1.1 (0.8,1.6)	1.4 (1.0,2.0)
Employment: Other	8.4 (7.3,9.6)	0.9 (0.8,1.1)	1.0 (0.8,1.2)	4.9 (4.1,5.9)	1.0 (0.8,1.3)	1.1 (0.9,1.4)
Employment: Employed	9.1 (8.3,10.0)	1.0 (ref)	1.0 (ref)	4.7 (4.2,5.3)	1.0 (ref)	1.0 (ref)
Healthcare cost barrier: Yes	10.9 (8.6,13.7)	1.2 (1.0,1.6)	1.4 (1.1,1.8)	5.5 (4.2,7.1)	1.1 (0.8,1.5)	1.3 (1.0,1.8)
Healthcare cost barrier: No	8.9 (8.2,9.7)	1.0 (ref)	1.0 (ref)	5.0 (4.4,5.6)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, an indicator of socioeconomic status (i.e., education attainment, annual household income, annual individual income, PIR, composite SES, employment status, or healthcare cost barrier), plus any significant interactions between a covariate, region, and/or socioeconomic status.

Table 3.8. United States, Asian men – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race:	Asian Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	8.9 (5.6,14.1)	1.2 (0.8,2.0)	1.2 (0.7,1.9)	3.7 (2.2,6.3)	1.0 (0.6,1.8)	1.5 (0.9,2.4)
Education: High school	9.6 (8.2,11.3)	1.3 (1.1,1.6)	1.1 (0.9,1.4)	3.9 (3.1,4.9)	1.1 (0.8,1.4)	1.0 (0.8,1.3)
Education: College	7.2 (6.5,8.0)	1.0 (ref)	1.0 (ref)	3.6 (3.1,4.2)	1.0 (ref)	1.0 (ref)
Household income: Missing	9.3 (7.1,12.2)	1.2 (0.9,1.6)	1.3 (1.0,1.9)	4.4 (2.9,6.7)	1.2 (0.8,2.0)	1.5 (0.9,2.5)
Household income: <$15K	7.6 (5.5,10.4)	0.9 (0.7,1.3)	1.1 (0.7,1.6)	3.9 (2.6,5.8)	1.1 (0.7,1.7)	1.3 (0.8,2.0)
Household income: <$25K	7.9 (5.9,10.5)	1.0 (0.7,1.4)	1.0 (0.7,1.5)	3.6 (2.4,5.3)	1.0 (0.7,1.6)	1.1 (0.7,1.8)
Household income: <$35K	6.0 (4.3,8.4)	0.7 (0.5,1.1)	0.8 (0.5,1.2)	3.0 (1.7,5.4)	0.9 (0.5,1.6)	1.0 (0.5,1.9)
Household income: <$50K	8.2 (6.4,10.5)	1.0 (0.8,1.4)	1.0 (0.7,1.3)	3.9 (2.8,5.5)	1.1 (0.8,1.6)	1.2 (0.8,1.8)
Household income: <$75K	8.5 (6.8,10.6)	1.1 (0.8,1.4)	1.1 (0.8,1.4)	4.0 (2.9,5.5)	1.1 (0.8,1.6)	1.2 (0.8,1.8)
Household income: ≥$75K	8.1 (7.0,9.3)	1.0 (ref)	1.0 (ref)	3.5 (2.9,4.2)	1.0 (ref)	1.0 (ref)
Individual income: Missing	9.4 (7.2,12.2)	1.0 (0.7,1.3)	1.2 (0.9,1.7)	4.3 (2.8,6.6)	0.9 (0.5,1.4)	1.1 (0.7,2.0)
Individual income: <$5K	8.3 (6.1,11.2)	0.9 (0.6,1.2)	1.0 (0.7,1.5)	4.1 (2.7,6.1)	0.8 (0.5,1.3)	1.1 (0.7,1.9)
Individual income: <$10K	6.3 (4.7,8.3)	0.7 (0.5,0.9)	0.7 (0.5,0.9)	2.8 (1.9,4.2)	0.6 (0.3,0.9)	0.6 (0.4,1.0)
Individual income: <$15K	7.6 (5.8,9.7)	0.8 (0.6,1.1)	0.9 (0.6,1.2)	3.4 (2.4,4.9)	0.7 (0.4,1.1)	0.8 (0.5,1.3)
Individual income: <$20K	7.2 (5.9,8.8)	0.7 (0.6,1.0)	0.9 (0.7,1.1)	3.0 (2.3,3.8)	0.6 (0.4,0.9)	0.7 (0.5,1.0)
Individual income: <$35K	8.7 (7.2,10.5)	0.9 (0.7,1.2)	1.0 (0.8,1.3)	4.2 (3.2,5.3)	0.8 (0.6,1.2)	1.0 (0.7,1.4)
Individual income: ≥$35K	9.7 (8.1,11.5)	1.0 (ref)	1.0 (ref)	4.9 (3.8,6.4)	1.0 (ref)	1.0 (ref)

Table 3.8. (Continued) United States, Asian men – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race:	Asian Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	9.4 (7.2,12.2)	1.2 (0.9,1.5)	1.2 (0.9,1.7)	4.3 (2.8,6.6)	1.1 (0.7,1.8)	1.3 (0.8,2.1)
PIR: <1	8.6 (6.5,11.3)	1.1 (0.8,1.4)	1.0 (0.7,1.4)	4.2 (2.9,6.0)	1.1 (0.7,1.6)	1.1 (0.7,1.7)
PIR: <2	6.7 (5.2,8.5)	0.8 (0.6,1.1)	0.7 (0.6,1.0)	3.1 (2.2,4.3)	0.8 (0.5,1.2)	0.8 (0.5,1.2)
PIR: <3	7.9 (6.2,10.1)	1.0 (0.7,1.3)	0.9 (0.7,1.2)	3.2 (2.3,4.5)	0.8 (0.6,1.2)	0.9 (0.6,1.3)
PIR: >=3	8.1 (7.2,9.2)	1.0 (ref)	1.0 (ref)	3.8 (3.3,4.5)	1.0 (ref)	1.0 (ref)
Composite SES: Missing	9.4 (7.2,12.2)	1.3 (1.0,1.7)	1.3 (1.0,1.7)	4.3 (2.8,6.5)	1.2 (0.8,1.9)	1.4 (0.9,2.3)
Composite SES: Low	10.4 (5.5,18.8)	1.4 (0.8,2.7)	1.7 (0.9,3.2)	4.4 (2.2,8.4)	1.3 (0.6,2.5)	1.6 (1.0,2.7)
Composite SES: Mid	8.5 (7.3,9.9)	1.2 (1.0,1.4)	1.1 (0.9,1.3)	3.8 (3.1,4.6)	1.1 (0.8,1.4)	1.1 (0.8,1.4)
Composite SES: High	7.3 (6.5,8.2)	1.0 (ref)	1.0 (ref)	3.5 (3.0,4.2)	1.0 (ref)	1.0 (ref)
Employment: Unemployed	10.2 (7.3,14.1)	1.4 (1.0,2.0)	1.5 (1.0,2.1)	4.6 (2.9,7.4)	1.4 (0.8,2.3)	1.4 (0.9,2.4)
Employment: Other	10.6 (8.6,13.0)	1.5 (1.2,1.9)	1.4 (1.1,1.8)	4.7 (3.6,6.0)	1.4 (1.0,1.9)	1.4 (1.0,1.9)
Employment: Employed	7.1 (6.5,7.9)	1.0 (ref)	1.0 (ref)	3.3 (2.9,3.8)	1.0 (ref)	1.0 (ref)
Healthcare cost barrier: Yes	9.2 (6.9,12.1)	1.1 (0.8,1.4)	1.1 (0.8,1.6)	3.9 (2.7,5.5)	1.0 (0.7,1.5)	1.1 (0.8,1.6)
Healthcare cost barrier: No	8.6 (7.7,9.5)	1.0 (ref)	1.0 (ref)	3.9 (3.4,4.5)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, an indicator of socioeconomic status (i.e., education attainment, annual household income, annual individual income, PIR, composite SES, employment status, or healthcare cost barrier), plus any significant interactions between a covariate, region, and/or socioeconomic status.

Table 3.9. United States, White women – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	White Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	15.8 (15.4,16.3)	1.2 (1.1,1.2)	1.2 (1.2,1.3)	12.0 (11.7,12.4)	1.3 (1.3,1.4)	1.4 (1.4,1.5)
Education: High school	14.2 (14.0,14.3)	1.0 (1.0,1.1)	1.0 (1.0,1.0)	10.0 (9.9,10.1)	1.1 (1.1,1.1)	1.1 (1.1,1.1)
Education: College	13.5 (13.3,13.7)	1.0 (ref)	1.0 (ref)	8.9 (8.8,9.1)	1.0 (ref)	1.0 (ref)
Household income: Missing	13.0 (12.7,13.3)	1.0 (1.0,1.0)	1.1 (1.1,1.1)	9.0 (8.8,9.3)	1.1 (1.0,1.1)	1.2 (1.1,1.2)
Household income: <$15K	18.2 (17.8,18.7)	1.4 (1.4,1.4)	1.5 (1.5,1.6)	14.2 (13.9,14.6)	1.7 (1.6,1.7)	1.8 (1.8,1.9)
Household income: <$25K	15.5 (15.2,15.9)	1.2 (1.2,1.2)	1.2 (1.2,1.2)	11.4 (11.1,11.7)	1.3 (1.3,1.4)	1.4 (1.3,1.4)
Household income: <$35K	14.2 (13.9,14.5)	1.1 (1.1,1.1)	1.1 (1.0,1.1)	10.0 (9.7,10.3)	1.2 (1.1,1.2)	1.2 (1.1,1.2)
Household income: <$50K	13.7 (13.4,14.0)	1.0 (1.0,1.1)	1.0 (1.0,1.0)	9.4 (9.2,9.6)	1.1 (1.1,1.1)	1.1 (1.0,1.1)
Household income: <$75K	13.4 (13.2,13.7)	1.0 (1.0,1.1)	1.0 (1.0,1.0)	9.1 (8.9,9.3)	1.1 (1.0,1.1)	1.0 (1.0,1.1)
Household income: ≥$75K	13.1 (12.9,13.3)	1.0 (ref)	1.0 (ref)	8.5 (8.4,8.7)	1.0 (ref)	1.0 (ref)
Individual income: Missing	13.0 (12.7,13.3)	1.0 (1.0,1.0)	1.1 (1.0,1.1)	9.0 (8.8,9.3)	1.0 (1.0,1.1)	1.1 (1.1,1.2)
Individual income: <$5K	17.6 (17.0,18.1)	1.3 (1.3,1.4)	1.4 (1.3,1.4)	13.1 (12.7,13.6)	1.5 (1.5,1.6)	1.6 (1.5,1.7)
Individual income: <$10K	16.6 (16.3,16.9)	1.3 (1.2,1.3)	1.2 (1.2,1.2)	12.1 (11.8,12.4)	1.4 (1.4,1.4)	1.3 (1.3,1.4)
Individual income: <$15K	14.5 (14.2,14.8)	1.1 (1.1,1.1)	1.1 (1.0,1.1)	10.2 (10.0,10.4)	1.2 (1.1,1.2)	1.1 (1.1,1.2)
Individual income: <$20K	13.3 (13.1,13.6)	1.0 (1.0,1.0)	1.0 (1.0,1.0)	9.1 (8.8,9.3)	1.0 (1.0,1.1)	1.0 (1.0,1.1)
Individual income: <$35K	13.1 (12.9,13.3)	1.0 (1.0,1.0)	1.0 (1.0,1.0)	9.1 (8.9,9.2)	1.0 (1.0,1.1)	1.0 (1.0,1.1)
Individual income: ≥$35K	13.1 (12.8,13.3)	1.0 (ref)	1.0 (ref)	8.7 (8.5,8.9)	1.0 (ref)	1.0 (ref)

Table 3.9. (Continued) United States, White women – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	White Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	13.0 (12.7,13.3)	1.0 (1.0,1.0)	1.1 (1.1,1.1)	9.0 (8.8,9.3)	1.0 (1.0,1.1)	1.2 (1.1,1.2)
PIR: <1	18.3 (17.9,18.8)	1.4 (1.4,1.4)	1.4 (1.4,1.5)	13.9 (13.6,14.3)	1.6 (1.5,1.6)	1.7 (1.7,1.8)
PIR: <2	15.6 (15.3,15.8)	1.2 (1.2,1.2)	1.2 (1.1,1.2)	11.2 (11.0,11.4)	1.3 (1.2,1.3)	1.3 (1.2,1.3)
PIR: <3	13.6 (13.4,13.9)	1.0 (1.0,1.1)	1.0 (1.0,1.1)	9.5 (9.3,9.7)	1.1 (1.1,1.1)	1.1 (1.0,1.1)
PIR: >=3	13.1 (12.9,13.2)	1.0 (ref)	1.0 (ref)	8.8 (8.6,8.9)	1.0 (ref)	1.0 (ref)
Composite SES: Missing	13.0 (12.7,13.3)	1.0 (0.9,1.0)	1.1 (1.0,1.1)	9.0 (8.8,9.3)	1.0 (1.0,1.1)	1.1 (1.1,1.2)
Composite SES: Low	16.2 (15.6,16.7)	1.2 (1.2,1.3)	1.3 (1.3,1.4)	12.4 (12.0,12.9)	1.4 (1.3,1.5)	1.6 (1.5,1.7)
Composite SES: Mid	14.5 (14.4,14.7)	1.1 (1.1,1.1)	1.0 (1.0,1.1)	10.3 (10.2,10.4)	1.2 (1.1,1.2)	1.1 (1.1,1.1)
Composite SES: High	13.4 (13.2,13.6)	1.0 (ref)	1.0 (ref)	8.8 (8.7,9.0)	1.0 (ref)	1.0 (ref)
Employment: Unemployed	24.6 (24.1,25.0)	1.8 (1.8,1.9)	1.7 (1.7,1.8)	19.5 (19.1,19.9)	2.1 (2.1,2.2)	2.0 (1.9,2.0)
Employment: Other	12.3 (12.2,12.5)	0.9 (0.9,0.9)	1.0 (1.0,1.0)	8.5 (8.4,8.7)	0.9 (0.9,1.0)	1.0 (1.0,1.1)
Employment: Employed	13.5 (13.4,13.7)	1.0 (ref)	1.0 (ref)	9.1 (9.0,9.2)	1.0 (ref)	1.0 (ref)
Healthcare cost barrier: Yes	21.0 (20.6,21.4)	1.5 (1.5,1.6)	1.5 (1.5,1.6)	15.1 (14.7,15.5)	1.6 (1.6,1.6)	1.6 (1.6,1.7)
Healthcare cost barrier: No	13.6 (13.5,13.7)	1.0 (ref)	1.0 (ref)	9.4 (9.3,9.5)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, an indicator of socioeconomic status (i.e., education attainment, annual household income, annual individual income, PIR, composite SES, employment status, or healthcare cost barrier), plus any significant interactions between a covariate, region, and/or socioeconomic status.

Table 3.10. United States, White men – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	White Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	11.7 (11.2,12.1)	1.1 (1.1,1.2)	1.2 (1.1,1.2)	7.4 (7.1,7.7)	1.3 (1.3,1.4)	1.4 (1.4,1.5)
Education: High school	10.9 (10.7,11.1)	1.1 (1.0,1.1)	1.0 (1.0,1.0)	6.1 (6.0,6.2)	1.1 (1.1,1.1)	1.1 (1.0,1.1)
Education: College	10.3 (10.1,10.5)	1.0 (ref)	1.0 (ref)	5.6 (5.4,5.7)	1.0 (ref)	1.0 (ref)
Household income: Missing	11.3 (10.9,11.7)	1.1 (1.0,1.1)	1.1 (1.1,1.2)	6.6 (6.3,6.9)	1.2 (1.1,1.3)	1.3 (1.2,1.3)
Household income: <$15K	14.0 (13.4,14.6)	1.3 (1.3,1.4)	1.5 (1.4,1.6)	9.6 (9.1,10.1)	1.8 (1.7,1.9)	2.1 (1.9,2.2)
Household income: <$25K	11.6 (11.2,11.9)	1.1 (1.1,1.2)	1.1 (1.1,1.2)	7.0 (6.7,7.3)	1.3 (1.2,1.4)	1.4 (1.3,1.5)
Household income: <$35K	10.3 (9.9,10.6)	1.0 (0.9,1.0)	1.0 (1.0,1.1)	5.9 (5.6,6.2)	1.1 (1.0,1.2)	1.1 (1.1,1.2)
Household income: <$50K	10.2 (9.9,10.5)	1.0 (0.9,1.0)	1.0 (1.0,1.0)	5.6 (5.4,5.8)	1.0 (1.0,1.1)	1.0 (1.0,1.1)
Household income: <$75K	10.0 (9.7,10.3)	1.0 (0.9,1.0)	1.0 (0.9,1.0)	5.3 (5.1,5.5)	1.0 (0.9,1.0)	1.0 (0.9,1.0)
Household income: ≥$75K	10.4 (10.2,10.6)	1.0 (ref)	1.0 (ref)	5.4 (5.3,5.6)	1.0 (ref)	1.0 (ref)
Individual income: Missing	11.3 (10.9,11.7)	1.2 (1.2,1.3)	1.2 (1.1,1.2)	6.6 (6.3,6.9)	1.3 (1.2,1.4)	1.3 (1.2,1.4)
Individual income: <$5K	12.1 (11.5,12.8)	1.3 (1.2,1.4)	1.4 (1.3,1.5)	7.5 (7.0,8.0)	1.5 (1.4,1.6)	1.8 (1.6,1.9)
Individual income: <$10K	12.4 (12.0,12.9)	1.3 (1.3,1.4)	1.2 (1.2,1.3)	7.4 (7.1,7.8)	1.5 (1.4,1.6)	1.5 (1.4,1.6)
Individual income: <$15K	11.2 (10.8,11.5)	1.2 (1.1,1.2)	1.1 (1.1,1.2)	6.2 (5.9,6.4)	1.2 (1.2,1.3)	1.2 (1.1,1.3)
Individual income: <$20K	10.5 (10.2,10.8)	1.1 (1.1,1.2)	1.1 (1.0,1.1)	5.8 (5.6,6.0)	1.1 (1.1,1.2)	1.1 (1.1,1.2)
Individual income: <$35K	10.0 (9.8,10.3)	1.1 (1.0,1.1)	1.0 (1.0,1.1)	5.4 (5.2,5.6)	1.1 (1.0,1.1)	1.0 (1.0,1.1)
Individual income: ≥$35K	9.4 (9.2,9.7)	1.0 (ref)	1.0 (ref)	5.1 (4.9,5.3)	1.0 (ref)	1.0 (ref)

Table 3.10. (Continued) United States, White men – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	White Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	11.3 (10.9,11.7)	1.1 (1.1,1.2)	1.1 (1.1,1.2)	6.6 (6.3,6.9)	1.2 (1.2,1.3)	1.3 (1.2,1.3)
PIR: <1	13.0 (12.5,13.6)	1.3 (1.2,1.4)	1.4 (1.3,1.5)	8.3 (7.9,8.8)	1.6 (1.5,1.6)	1.8 (1.7,1.9)
PIR: <2	11.7 (11.4,12.1)	1.2 (1.1,1.2)	1.1 (1.1,1.2)	7.0 (6.7,7.2)	1.3 (1.2,1.4)	1.3 (1.3,1.4)
PIR: <3	10.5 (10.2,10.8)	1.1 (1.0,1.1)	1.0 (1.0,1.1)	5.7 (5.5,5.9)	1.1 (1.0,1.1)	1.0 (1.0,1.1)
PIR: >=3	10.0 (9.8,10.2)	1.0 (ref)	1.0 (ref)	5.3 (5.2,5.5)	1.0 (ref)	1.0 (ref)
Composite SES: Missing	11.3 (10.9,11.7)	1.1 (1.1,1.2)	1.1 (1.1,1.2)	6.6 (6.3,6.9)	1.2 (1.1,1.3)	1.2 (1.2,1.3)
Composite SES: Low	11.3 (10.7,11.8)	1.1 (1.0,1.2)	1.3 (1.2,1.4)	7.5 (7.1,8.0)	1.4 (1.3,1.5)	1.7 (1.6,1.9)
Composite SES: Mid	10.9 (10.7,11.1)	1.1 (1.0,1.1)	1.0 (1.0,1.1)	6.1 (5.9,6.2)	1.1 (1.1,1.1)	1.1 (1.1,1.1)
Composite SES: High	10.2 (10.0,10.4)	1.0 (ref)	1.0 (ref)	5.5 (5.4,5.7)	1.0 (ref)	1.0 (ref)
Employment: Unemployed	16.7 (16.2,17.2)	1.7 (1.6,1.7)	1.6 (1.6,1.7)	11.1 (10.7,11.5)	2.1 (2.0,2.2)	2.1 (2.0,2.2)
Employment: Other	10.4 (10.2,10.7)	1.0 (1.0,1.1)	1.2 (1.1,1.2)	6.4 (6.2,6.6)	1.2 (1.2,1.3)	1.3 (1.2,1.3)
Employment: Employed	10.0 (9.9,10.2)	1.0 (ref)	1.0 (ref)	5.2 (5.1,5.3)	1.0 (ref)	1.0 (ref)
Healthcare cost barrier: Yes	16.1 (15.6,16.7)	1.5 (1.5,1.6)	1.5 (1.4,1.6)	9.8 (9.4,10.3)	1.7 (1.6,1.8)	1.8 (1.7,1.9)
Healthcare cost barrier: No	10.6 (10.5,10.8)	1.5 (1.5,1.6)	1.0 (ref)	5.8 (5.7,6.0)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, an indicator of socioeconomic status (i.e., education attainment, annual household income, annual individual income, PIR, composite SES, employment status, or healthcare cost barrier), plus any significant interactions between a covariate, region, and/or socioeconomic status.

Table 3.11. United States, Other race women – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race:	Other Race Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	15.3 (14.7,15.9)	1.1 (1.0,1.1)	1.2 (1.1,1.2)	11.6 (11.0,12.1)	1.2 (1.1,1.3)	1.4 (1.3,1.5)
Education: High school	16.2 (15.8,16.6)	1.1 (1.1,1.2)	1.1 (1.0,1.1)	11.6 (11.3,11.9)	1.2 (1.1,1.3)	1.2 (1.1,1.3)
Education: College	14.5 (14.0,15.1)	1.0 (ref)	1.0 (ref)	9.6 (9.1,10.0)	1.0 (ref)	1.0 (ref)
Household income: Missing	14.3 (13.7,15.0)	1.0 (0.9,1.1)	1.2 (1.1,1.3)	9.9 (9.3,10.5)	1.1 (1.0,1.2)	1.3 (1.2,1.5)
Household income: <$15K	19.2 (18.5,19.9)	1.3 (1.2,1.4)	1.4 (1.3,1.5)	14.8 (14.2,15.4)	1.6 (1.5,1.8)	1.7 (1.6,1.9)
Household income: <$25K	16.1 (15.5,16.7)	1.1 (1.0,1.2)	1.1 (1.1,1.3)	11.7 (11.3,12.3)	1.3 (1.2,1.4)	1.4 (1.2,1.5)
Household income: <$35K	14.6 (13.9,15.4)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	10.4 (9.8,11.0)	1.1 (1.0,1.2)	1.1 (1.0,1.3)
Household income: <$50K	14.3 (13.6,15.1)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	9.8 (9.2,10.5)	1.1 (1.0,1.2)	1.1 (0.9,1.2)
Household income: <$75K	14.7 (13.9,15.6)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	10.0 (9.3,10.8)	1.1 (1.0,1.2)	1.1 (1.0,1.3)
Household income: ≥$75K	14.5 (13.6,15.4)	1.0 (ref)	1.0 (ref)	9.2 (8.5,9.9)	1.0 (ref)	1.0 (ref)
Individual income: Missing	14.4 (13.7,15.1)	1.0 (0.9,1.0)	1.1 (1.0,1.2)	9.9 (9.3,10.5)	1.0 (0.9,1.1)	1.2 (1.1,1.4)
Individual income: <$5K	17.2 (16.5,17.9)	1.2 (1.1,1.2)	1.1 (1.0,1.3)	12.9 (12.3,13.5)	1.4 (1.2,1.5)	1.5 (1.3,1.6)
Individual income: <$10K	16.6 (16.0,17.2)	1.1 (1.0,1.2)	1.0 (0.9,1.2)	12.1 (11.6,12.6)	1.3 (1.2,1.4)	1.2 (1.1,1.4)
Individual income: <$15K	15.4 (14.7,16.2)	1.0 (1.0,1.1)	1.0 (0.9,1.1)	10.9 (10.3,11.5)	1.1 (1.0,1.3)	1.1 (1.0,1.3)
Individual income: <$20K	14.9 (14.1,15.7)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	10.1 (9.5,10.8)	1.1 (1.0,1.2)	1.1 (0.9,1.2)
Individual income: <$35K	14.6 (14.0,15.2)	1.0 (0.9,1.1)	0.9 (0.8,1.0)	10.2 (9.7,10.8)	1.1 (1.0,1.2)	1.1 (0.9,1.2)
Individual income: ≥$35K	14.9 (14.0,15.9)	1.0 (ref)	1.0 (ref)	9.6 (8.9,10.3)	1.0 (ref)	1.0 (ref)

Table 3.11. (Continued) United States, Other race women – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race:	Other Race Women					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	14.4 (13.7,15.1)	1.0 (0.9,1.1)	1.1 (1.1,1.2)	9.9 (9.3,10.5)	1.0 (1.0,1.1)	1.2 (1.1,1.3)
PIR: <1	18.0 (17.4,18.6)	1.2 (1.2,1.3)	1.3 (1.2,1.4)	13.6 (13.1,14.2)	1.4 (1.3,1.5)	1.5 (1.4,1.6)
PIR: <2	15.9 (15.4,16.4)	1.1 (1.0,1.2)	1.1 (1.0,1.2)	11.5 (11.0,11.9)	1.2 (1.1,1.3)	1.2 (1.1,1.3)
PIR: <3	14.6 (13.9,15.3)	1.0 (0.9,1.1)	1.0 (0.9,1.0)	10.2 (9.6,10.8)	1.1 (1.0,1.1)	1.0 (0.9,1.1)
PIR: >=3	14.5 (13.9,15.0)	1.0 (ref)	1.0 (ref)	9.6 (9.2,10.1)	1.0 (ref)	1.0 (ref)
Composite SES: Missing	14.4 (13.8,15.1)	1.0 (1.0,1.1)	1.2 (1.1,1.3)	9.9 (9.4,10.5)	1.1 (1.0,1.2)	1.3 (1.2,1.4)
Composite SES: Low	15.6 (14.9,16.4)	1.1 (1.1,1.2)	1.2 (1.1,1.3)	11.9 (11.3,12.6)	1.3 (1.2,1.4)	1.5 (1.3,1.6)
Composite SES: Mid	16.5 (16.1,16.9)	1.2 (1.1,1.2)	1.1 (1.1,1.2)	11.9 (11.6,12.2)	1.3 (1.3,1.4)	1.3 (1.2,1.4)
Composite SES: High	13.9 (13.3,14.5)	1.0 (ref)	1.0 (ref)	8.9 (8.5,9.5)	1.0 (ref)	1.0 (ref)
Employment: Unemployed	23.5 (22.8,24.2)	1.7 (1.6,1.7)	1.6 (1.5,1.7)	18.6 (18.0,19.3)	2.0 (1.9,2.1)	1.9 (1.8,2.0)
Employment: Other	14.0 (13.5,14.5)	1.0 (1.0,1.0)	1.1 (1.1,1.2)	9.7 (9.3,10.2)	1.0 (1.0,1.1)	1.2 (1.1,1.3)
Employment: Employed	14.0 (13.6,14.3)	1.0 (ref)	1.0 (ref)	9.5 (9.2,9.8)	1.0 (ref)	1.0 (ref)
Healthcare cost barrier: Yes	19.5 (18.8,20.3)	1.3 (1.2,1.3)	1.4 (1.4,1.5)	14.0 (13.4,14.6)	1.3 (1.2,1.4)	1.5 (1.4,1.6)
Healthcare cost barrier: No	15.2 (14.8,15.5)	1.0 (ref)	1.0 (ref)	10.7 (10.4,11.0)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, an indicator of socioeconomic status (i.e., education attainment, annual household income, annual individual income, PIR, composite SES, employment status, or healthcare cost barrier), plus any significant interactions between a covariate, region, and/or socioeconomic status.

Table 3.12. United States, Other race men – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	Other Race Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	10.3 (9.6,11.0)	1.0 (0.9,1.1)	1.0 (0.9,1.2)	6.6 (6.0,7.1)	1.3 (1.1,1.4)	1.4 (1.2,1.6)
Education: High school	12.2 (11.8,12.7)	1.2 (1.1,1.3)	1.1 (1.1,1.2)	6.6 (6.3,6.9)	1.3 (1.1,1.4)	1.3 (1.1,1.4)
Education: College	10.2 (9.7,10.9)	1.0 (ref)	1.0 (ref)	5.2 (4.8,5.7)	1.0 (ref)	1.0 (ref)
Household income: Missing	12.1 (11.3,13.1)	1.1 (1.0,1.2)	1.1 (1.0,1.2)	7.0 (6.3,7.7)	1.3 (1.1,1.5)	1.6 (1.3,1.9)
Household income: <$15K	12.4 (11.5,13.4)	1.1 (1.0,1.2)	1.1 (1.0,1.3)	8.2 (7.5,8.9)	1.5 (1.3,1.7)	1.9 (1.6,2.3)
Household income: <$25K	11.2 (10.5,12.0)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	6.6 (6.0,7.2)	1.2 (1.0,1.4)	1.4 (1.2,1.7)
Household income: <$35K	10.2 (9.4,11.0)	0.9 (0.8,1.0)	0.9 (0.8,1.0)	5.5 (4.9,6.1)	1.0 (0.9,1.2)	1.2 (1.0,1.4)
Household income: <$50K	10.8 (9.9,11.8)	0.9 (0.8,1.1)	0.9 (0.8,1.0)	5.2 (4.7,5.8)	1.0 (0.8,1.1)	1.1 (0.9,1.3)
Household income: <$75K	11.4 (10.5,12.4)	1.0 (0.9,1.1)	0.9 (0.8,1.0)	6.0 (5.3,6.7)	1.1 (0.9,1.3)	1.2 (1.0,1.5)
Household income: ≥$75K	11.4 (10.6,12.3)	1.0 (ref)	1.0 (ref)	5.5 (4.9,6.1)	1.0 (ref)	1.0 (ref)
Individual income: Missing	12.1 (11.2,13.0)	1.2 (1.1,1.4)	1.3 (1.1,1.4)	6.9 (6.3,7.7)	1.5 (1.3,1.8)	1.7 (1.5,2.0)
Individual income: <$5K	11.0 (10.2,11.9)	1.1 (1.0,1.3)	1.2 (1.0,1.3)	7.0 (6.3,7.7)	1.5 (1.3,1.8)	1.7 (1.5,2.1)
Individual income: <$10K	11.2 (10.5,11.9)	1.1 (1.0,1.3)	1.1 (1.0,1.3)	6.4 (5.9,7.0)	1.4 (1.2,1.6)	1.5 (1.3,1.7)
Individual income: <$15K	11.6 (10.7,12.6)	1.2 (1.1,1.3)	1.2 (1.0,1.3)	5.9 (5.3,6.5)	1.3 (1.1,1.5)	1.3 (1.1,1.6)
Individual income: <$20K	11.7 (10.8,12.7)	1.2 (1.1,1.3)	1.2 (1.0,1.3)	6.1 (5.4,6.8)	1.3 (1.1,1.5)	1.3 (1.1,1.5)
Individual income: <$35K	11.5 (10.8,12.3)	1.2 (1.1,1.3)	1.2 (1.1,1.3)	6.0 (5.5,6.6)	1.3 (1.1,1.5)	1.3 (1.1,1.5)
Individual income: ≥$35K	9.8 (9.0,10.6)	1.0 (ref)	1.0 (ref)	4.6 (4.1,5.2)	1.0 (ref)	1.0 (ref)

Table 3.12. (Continued) United States, Other race men – Lifetime and current asthma prevalence and socioeconomic associations - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/Race	Other Race Men					
	Lifetime asthma			Current asthma		
	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence, P% (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	12.1 (11.2,13.0)	1.1 (1.0,1.2)	1.1 (1.0,1.2)	6.9 (6.3,7.7)	1.3 (1.1,1.4)	1.5 (1.3,1.7)
PIR: <1	11.6 (10.8,12.4)	1.0 (1.0,1.1)	1.1 (1.0,1.2)	7.5 (6.9,8.2)	1.4 (1.2,1.5)	1.6 (1.4,1.8)
PIR: <2	11.1 (10.5,11.9)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	6.0 (5.5,6.5)	1.1 (1.0,1.2)	1.2 (1.1,1.3)
PIR: <3	11.1 (10.4,11.9)	1.0 (0.9,1.1)	1.0 (0.9,1.1)	5.9 (5.4,6.5)	1.1 (1.0,1.2)	1.1 (1.0,1.3)
PIR: >=3	11.1 (10.6,11.7)	1.0 (ref)	1.0 (ref)	5.5 (5.1,5.9)	1.0 (ref)	1.0 (ref)
Composite SES: Missing	12.0 (11.1,12.9)	1.2 (1.0,1.3)	1.2 (1.1,1.3)	6.9 (6.2,7.6)	1.4 (1.2,1.6)	1.5 (1.3,1.8)
Composite SES: Low	9.4 (8.6,10.3)	0.9 (0.8,1.0)	1.0 (0.9,1.1)	6.3 (5.7,7.0)	1.2 (1.1,1.4)	1.4 (1.2,1.6)
Composite SES: Mid	11.9 (11.5,12.4)	1.1 (1.1,1.2)	1.1 (1.0,1.2)	6.4 (6.1,6.8)	1.3 (1.1,1.4)	1.3 (1.1,1.4)
Composite SES: High	10.4 (9.7,11.1)	1.0 (ref)	1.0 (ref)	5.1 (4.6,5.6)	1.0 (ref)	1.0 (ref)
Employment: Unemployed	15.8 (14.9,16.8)	1.6 (1.5,1.7)	1.6 (1.5,1.7)	10.4 (9.7,11.1)	2.1 (1.9,2.3)	2.1 (1.9,2.3)
Employment: Other	12.8 (11.9,13.7)	1.3 (1.2,1.4)	1.4 (1.3,1.6)	7.7 (7.1,8.5)	1.6 (1.4,1.8)	1.7 (1.5,1.9)
Employment: Employed	9.9 (9.5,10.2)	1.0 (ref)	1.0 (ref)	4.9 (4.6,5.1)	1.0 (ref)	1.0 (ref)
Healthcare cost barrier: Yes	14.9 (13.9,16.0)	1.4 (1.3,1.5)	1.5 (1.3,1.6)	9.0 (8.2,9.9)	1.5 (1.4,1.7)	1.7 (1.5,1.9)
Healthcare cost barrier: No	10.8 (10.4,11.2)	1.0 (ref)	1.0 (ref)	5.8 (5.5,6.2)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, an indicator of socioeconomic status (i.e., education attainment, annual household income, annual individual income, PIR, composite SES, employment status, or healthcare cost barrier), plus any significant interactions between a covariate, region, and/or socioeconomic status.

Asthma Prevalence Disparities By Race in the United States, After Control for Socioeconomic Status and Sociodemographics

After controlling for covariates, and within subpopulations defined by different measures of SES, racial disparities in US asthma prevalence were attenuated but continued to persist in some strata for both women and men (Tables 3.13 thru 3.16). Regardless of sex/SES, asthma prevalence estimates were consistently and demonstrably lowest for Asians, including after adjustment. Estimates of racial disparities in asthma prevalence were meaningfully altered by adjustment for potential sociodemographic confounders only for Whites.

Adjusted asthma prevalence estimates were often highest for NHOPI compared to all other racial groups, although these results were not significant and depended on sex, SES measure, and asthma type. For example, point estimates of adjusted lifetime asthma prevalence among women reporting the lowest levels of each SES measure were consistently most elevated for NHOPI women (Table 3.13), and most elevated for NHOPI men who reported the lowest levels of income, PIR, unemployment, or having a healthcare cost barrier (Table 3.14). Within the upper levels of each SES measure, except education and composite SES, an asthma ever-diagnosis was consistently most common among women identifying as NHOPI. Similarly, among men who reported college graduation, highest individual income, highest composite SES, employment, or no healthcare cost barrier, lifetime asthma was most common among NHOPI. Additionally, within both of the uppermost household and individual income levels as well as within some middle levels of SES measures such as education and mid composite SES, point estimates of lifetime asthma prevalence were most elevated by race for NHOPI. Racial disparities in lifetime asthma within middle levels of income or PIR < 2 were greatest for NHOPI men but not NHOPI women.

Among women who reported the same level of an SES indicator, adjusted current asthma prevalence was often somewhat higher among those of Other race than among NHOPI, although such inter-racial differences were not statistically significant. However, this pattern reversed within the lowest levels of some SES measures: Current asthma was somewhat more common among NHOPI than Other race women only for those reporting the lowest levels of income, PIR, composite SES, or unemployment.

Adjusted estimates of lifetime and current asthma prevalence were not demonstrably different among Whites and those of Other race, regardless of sex and SES. However, point estimates of asthma prevalence were often somewhat higher among Other race women than Whites, especially for current asthma.

For SES/sex groups not reporting household income, racial differences in asthma prevalence were similar to those observed within lower and middle levels of SES.

Table 3.13. United States, by female sex and socioeconomic characteristics – Lifetime asthma prevalence and associations with race, compared to Asians - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/SES	NHOPI Women		White Women		Other Race Women	
	Lifetime asthma					
	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	2.2 (1.3,3.8)	2.4 (1.4,4.2)	1.8 (1.3,2.5)	1.6 (1.1,2.5)	1.7 (1.3,2.4)	1.7 (1.1,2.6)
Education: High school	1.9 (1.6,2.3)	1.7 (1.3,2.2)	1.5 (1.3,1.7)	1.5 (1.2,1.7)	1.7 (1.5,1.9)	1.6 (1.4,1.9)
Education: College	1.9 (1.5,2.5)	1.4 (1.1,1.9)	1.6 (1.5,1.8)	1.4 (1.3,1.6)	1.7 (1.6,1.9)	1.5 (1.3,1.7)
Household income: Missing	2.0 (1.4,3.0)	2.1 (1.3,3.3)	1.7 (1.4,2.0)	1.7 (1.3,2.1)	1.8 (1.5,2.2)	2.0 (1.6,2.6)
Household income: <$15K	2.8 (1.9,4.4)	2.0 (1.3,3.1)	2.1 (1.6,2.8)	1.6 (1.2,2.1)	2.2 (1.7,2.9)	1.6 (1.2,2.2)
Household income: <$25K	2.5 (1.7,3.8)	2.0 (1.4,3.0)	2.3 (1.8,2.9)	2.0 (1.5,2.5)	2.3 (1.8,3.0)	2.0 (1.5,2.6)
Household income: <$35K	1.7 (1.1,2.7)	1.3 (0.7,2.4)	1.7 (1.3,2.3)	1.4 (1.0,2.0)	1.8 (1.4,2.3)	1.4 (1.0,2.0)
Household income: <$50K	1.9 (1.3,2.8)	1.5 (1.0,2.3)	1.8 (1.4,2.2)	1.7 (1.3,2.1)	1.8 (1.5,2.3)	1.7 (1.3,2.1)
Household income: <$75K	1.9 (1.3,2.6)	1.7 (1.2,2.4)	1.2 (1.0,1.4)	1.2 (1.0,1.4)	1.3 (1.1,1.6)	1.3 (1.0,1.6)
Household income: ≥$75K	1.8 (1.3,2.5)	1.5 (1.0,2.2)	1.4 (1.2,1.6)	1.3 (1.1,1.5)	1.6 (1.4,1.8)	1.4 (1.2,1.6)
Individual income: Missing	2.0 (1.4,2.9)	2.1 (1.3,3.3)	1.6 (1.4,2.0)	1.7 (1.3,2.1)	1.8 (1.5,2.2)	2.0 (1.6,2.6)
Individual income: <$5K	2.6 (1.8,3.9)	2.3 (1.5,3.7)	2.2 (1.7,2.9)	1.8 (1.3,2.5)	2.2 (1.7,2.9)	1.8 (1.3,2.5)
Individual income: <$10K	1.6 (1.1,2.5)	1.3 (0.8,2.2)	1.9 (1.4,2.5)	1.5 (1.1,2.0)	1.9 (1.4,2.5)	1.5 (1.2,2.1)
Individual income: <$15K	2.2 (1.5,3.2)	1.6 (1.0,2.5)	2.0 (1.6,2.4)	2.0 (1.6,2.5)	2.1 (1.7,2.6)	2.1 (1.7,2.7)
Individual income: <$20K	2.4 (1.7,3.4)	2.1 (1.4,3.1)	1.5 (1.3,1.8)	1.4 (1.1,1.8)	1.7 (1.4,2.0)	1.6 (1.2,2.0)
Individual income: <$35K	1.9 (1.4,2.6)	1.7 (1.3,2.4)	1.3 (1.1,1.5)	1.2 (1.0,1.4)	1.5 (1.3,1.7)	1.3 (1.1,1.6)
Individual income: ≥$35K	1.2 (0.8,1.8)	1.3 (0.9,1.9)	1.2 (1.1,1.5)	1.1 (0.9,1.3)	1.4 (1.2,1.7)	1.2 (1.0,1.5)

Table 3.13. (Continued) United States, by female sex and socioeconomic characteristics – Lifetime asthma prevalence and associations with race, compared to Asians - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/SES	NHOPI Women		White Women		Other Race Women	
	Lifetime asthma					
	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	2.0 (1.4,2.9)	2.0 (1.3,3.3)	1.6 (1.4,2.0)	1.7 (1.3,2.1)	1.8 (1.5,2.2)	2.0 (1.6,2.6)
PIR: <1	3.0 (2.1,4.3)	2.8 (1.8,4.3)	2.4 (1.9,3.1)	2.1 (1.6,2.8)	2.4 (1.9,3.1)	2.1 (1.6,2.8)
PIR: <2	1.6 (1.1,2.3)	1.2 (0.8,1.8)	1.8 (1.5,2.2)	1.6 (1.3,2.1)	1.9 (1.5,2.3)	1.7 (1.3,2.1)
PIR: <3	1.8 (1.3,2.6)	1.5 (1.1,2.2)	1.5 (1.2,1.9)	1.5 (1.2,1.9)	1.6 (1.3,2.0)	1.5 (1.2,2.0)
PIR: >=3	2.0 (1.6,2.6)	1.6 (1.2,2.2)	1.4 (1.2,1.5)	1.3 (1.1,1.5)	1.5 (1.4,1.7)	1.4 (1.2,1.6)
Composite SES: Missing	2.0 (1.4,2.9)	2.1 (1.3,3.3)	1.6 (1.4,2.0)	1.7 (1.3,2.1)	1.8 (1.5,2.2)	2.1 (1.6,2.6)
Composite SES: Low	1.8 (0.9,3.8)	1.9 (1.0,3.9)	1.7 (1.1,2.6)	1.6 (0.9,2.6)	1.7 (1.1,2.5)	1.5 (0.9,2.6)
Composite SES: Mid	2.0 (1.6,2.5)	1.8 (1.4,2.3)	1.6 (1.4,1.8)	1.5 (1.3,1.7)	1.8 (1.6,2.0)	1.7 (1.4,1.9)
Composite SES: High	1.9 (1.4,2.5)	1.4 (1.0,1.8)	1.6 (1.4,1.7)	1.4 (1.2,1.6)	1.6 (1.4,1.8)	1.4 (1.2,1.7)
Employment: Unemployed	2.8 (1.9,4.1)	1.9 (1.2,2.8)	2.9 (2.3,3.7)	1.8 (1.4,2.4)	2.8 (2.2,3.5)	1.8 (1.4,2.4)
Employment: Other	1.9 (1.5,2.6)	1.7 (1.2,2.5)	1.5 (1.3,1.7)	1.5 (1.3,1.8)	1.7 (1.5,1.9)	1.7 (1.5,2.1)
Employment: Employed	1.9 (1.5,2.2)	1.5 (1.2,1.9)	1.5 (1.3,1.6)	1.3 (1.2,1.5)	1.5 (1.4,1.7)	1.4 (1.2,1.6)
Healthcare cost barrier: Yes	1.9 (1.3,2.7)	1.7 (1.1,2.5)	1.9 (1.5,2.4)	1.7 (1.3,2.3)	1.8 (1.4,2.3)	1.7 (1.3,2.3)
Healthcare cost barrier: No	1.9 (1.6,2.3)	1.7 (1.3,2.2)	1.5 (1.4,1.7)	1.4 (1.2,1.6)	1.7 (1.6,1.9)	1.6 (1.4,1.8)

[a]Adjusted for: Race, region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and race, plus any significant interactions between a covariate, region, and/or race. Models for healthcare cost barrier also included recent healthcare utilization as a covariate but were run only for 2005-2010 data due to missing in the earlier time period.

Table 3.14. United States, by male sex and socioeconomic characteristics – Lifetime asthma prevalence and associations with race, compared to Asians - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/SES	NHOPI Men		White Men		Other Race Men	
	Lifetime asthma					
	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	1.4 (0.7,2.8)	1.2 (0.6,2.4)	1.3 (0.8,2.1)	1.3 (0.9,2.0)	1.1 (0.7,1.8)	1.3 (0.9,1.9)
Education: High school	1.9 (1.4,2.5)	1.8 (1.3,2.5)	1.1 (1.0,1.3)	1.2 (0.9,1.5)	1.3 (1.1,1.5)	1.3 (1.1,1.7)
Education: College	1.7 (1.2,2.3)	1.5 (1.0,2.1)	1.4 (1.3,1.6)	1.4 (1.2,1.6)	1.4 (1.3,1.6)	1.4 (1.2,1.6)
Household income: Missing	2.3 (1.2,4.2)	1.4 (0.9,2.1)	1.2 (0.9,1.6)	1.0 (0.7,1.5)	1.3 (1.0,1.7)	1.1 (0.8,1.6)
Household income: <$15K	1.8 (0.9,3.3)	2.0 (1.2,3.6)	1.8 (1.3,2.6)	1.7 (1.3,2.4)	1.6 (1.2,2.3)	1.6 (1.1,2.3)
Household income: <$25K	2.2 (1.4,3.4)	2.3 (1.4,3.9)	1.5 (1.1,1.9)	1.7 (1.2,2.4)	1.4 (1.1,1.9)	1.7 (1.2,2.3)
Household income: <$35K	3.0 (1.7,5.3)	2.8 (1.6,4.9)	1.7 (1.2,2.4)	1.7 (1.2,2.5)	1.7 (1.2,2.4)	1.7 (1.2,2.5)
Household income: <$50K	1.8 (1.1,3.0)	1.6 (0.9,2.7)	1.2 (1.0,1.6)	1.7 (1.3,2.2)	1.3 (1.0,1.7)	1.8 (1.4,2.4)
Household income: <$75K	1.6 (1.0,2.5)	1.6 (1.1,2.3)	1.2 (0.9,1.5)	1.3 (1.0,1.6)	1.3 (1.1,1.7)	1.4 (1.1,1.8)
Household income: ≥$75K	1.7 (1.2,2.3)	1.5 (1.0,2.1)	1.3 (1.1,1.5)	1.4 (1.2,1.6)	1.4 (1.2,1.7)	1.5 (1.3,1.8)
Individual income: Missing	2.3 (1.3,4.3)	1.5 (0.9,2.3)	1.2 (0.9,1.6)	1.0 (0.7,1.4)	1.3 (1.0,1.7)	1.1 (0.8,1.6)
Individual income: <$5K	1.6 (1.0,2.8)	1.5 (0.9,2.6)	1.5 (1.1,2.0)	1.3 (1.0,1.8)	1.3 (1.0,1.8)	1.2 (0.9,1.7)
Individual income: <$10K	2.3 (1.5,3.7)	3.1 (1.9,5.2)	2.0 (1.5,2.6)	2.6 (1.9,3.5)	1.8 (1.3,2.4)	2.4 (1.8,3.3)
Individual income: <$15K	1.9 (1.2,3.1)	2.1 (1.2,3.7)	1.5 (1.1,1.9)	1.6 (1.2,2.2)	1.5 (1.2,2.0)	1.7 (1.3,2.3)
Individual income: <$20K	2.2 (1.4,3.3)	1.2 (0.7,2.1)	1.5 (1.2,1.8)	1.1 (0.8,1.6)	1.6 (1.3,2.0)	1.3 (0.9,1.8)
Individual income: <$35K	1.9 (1.2,2.9)	1.7 (1.0,2.6)	1.2 (1.0,1.4)	1.1 (0.9,1.5)	1.3 (1.1,1.6)	1.3 (1.0,1.7)
Individual income: ≥$35K	1.2 (0.8,2.0)	1.2 (0.8,2.0)	1.0 (0.8,1.2)	1.1 (0.9,1.3)	1.0 (0.8,1.2)	1.1 (0.9,1.4)

Table 3.15. (Continued) United States, by male sex and socioeconomic characteristics – Lifetime asthma prevalence and associations with race, compared to Asians - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/SES	NHOPI Men		White Men		Other Race Men	
	Lifetime asthma					
	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	2.4 (1.3,4.3)	1.4 (0.9,2.3)	1.2 (0.9,1.6)	1.0 (0.7,1.4)	1.3 (1.0,1.7)	1.1 (0.8,1.6)
PIR: <1	1.7 (1.0,2.7)	1.7 (1.1,2.8)	1.5 (1.1,2.0)	1.5 (1.1,2.0)	1.4 (1.0,1.8)	1.3 (1.0,1.8)
PIR: <2	2.2 (1.4,3.2)	2.3 (1.4,3.7)	1.8 (1.4,2.3)	2.1 (1.6,2.8)	1.7 (1.3,2.2)	2.1 (1.6,2.7)
PIR: <3	2.0 (1.2,3.1)	1.7 (0.9,3.1)	1.3 (1.0,1.7)	1.5 (1.0,2.0)	1.4 (1.1,1.8)	1.6 (1.1,2.2)
PIR: >=3	1.8 (1.3,2.4)	1.5 (1.1,2.0)	1.2 (1.1,1.4)	1.3 (1.1,1.5)	1.4 (1.2,1.6)	1.5 (1.3,1.7)
Composite SES: Missing	2.3 (1.3,4.2)	1.7 (1.0,2.7)	1.2 (0.9,1.6)	1.1 (0.8,1.5)	1.3 (1.0,1.7)	1.1 (0.8,1.6)
Composite SES: Low	0.8 (0.3,2.1)	0.6 (0.2,1.4)	1.1 (0.6,2.0)	0.8 (0.5,1.5)	0.9 (0.5,1.7)	0.7 (0.4,1.3)
Composite SES: Mid	1.9 (1.5,2.5)	1.8 (1.4,2.5)	1.3 (1.1,1.5)	1.4 (1.2,1.7)	1.4 (1.2,1.6)	1.6 (1.3,1.9)
Composite SES: High	1.6 (1.1,2.3)	1.7 (1.1,2.6)	1.4 (1.2,1.6)	1.3 (1.1,1.5)	1.4 (1.2,1.6)	1.3 (1.1,1.6)
Employment: Unemployed	1.7 (1.0,2.7)	1.3 (0.8,2.0)	1.6 (1.2,2.3)	1.2 (0.9,1.8)	1.6 (1.1,2.2)	1.2 (0.8,1.7)
Employment: Other	1.3 (0.9,2.0)	0.9 (0.5,1.5)	1.0 (0.8,1.2)	1.1 (0.8,1.4)	1.2 (1.0,1.5)	1.2 (0.9,1.7)
Employment: Employed	2.2 (1.8,2.8)	2.2 (1.7,2.8)	1.4 (1.3,1.5)	1.5 (1.4,1.7)	1.4 (1.2,1.5)	1.6 (1.4,1.7)
Healthcare cost barrier: Yes	1.9 (1.2,3.0)	2.6 (1.6,4.4)	1.8 (1.3,2.3)	2.2 (1.7,3.0)	1.6 (1.2,2.2)	2.2 (1.6,2.9)
Healthcare cost barrier: No	2.0 (1.6,2.6)	1.6 (1.2,2.2)	1.2 (1.1,1.4)	1.3 (1.1,1.5)	1.3 (1.1,1.4)	1.4 (1.2,1.6)

[a]Adjusted for: Race, region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and race, plus any significant interactions between a covariate, region, and/or race. Models for healthcare cost barrier also included recent healthcare utilization as a covariate but were run only for 2005-2010 data due to missing in the earlier time period.

Table 3.16. United States, by female sex and socioeconomic characteristics – Current asthma prevalence and associations with race, compared to Asians - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/SES	NHOPI Women		White Women		Other Women	
	Current asthma					
	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	2.4 (1.2,4.7)	1.7 (0.8,3.5)	2.3 (1.6,3.2)	1.6 (1.0,2.7)	2.2 (1.6,3.1)	1.7 (1.0,2.8)
Education: High school	2.3 (1.8,3.0)	1.7 (1.3,2.4)	1.9 (1.6,2.3)	1.6 (1.3,2.0)	2.2 (1.9,2.6)	1.9 (1.5,2.3)
Education: College	2.0 (1.4,2.7)	1.4 (1.0,1.9)	2.0 (1.7,2.3)	1.8 (1.6,2.1)	2.1 (1.9,2.4)	1.9 (1.6,2.3)
Household income: Missing	2.3 (1.4,3.7)	2.2 (1.1,4.3)	2.3 (1.8,2.9)	2.7 (1.9,3.7)	2.5 (2.0,3.2)	3.3 (2.3,4.6)
Household income: <$15K	3.1 (1.8,5.3)	2.3 (1.4,4.0)	2.5 (1.8,3.4)	2.0 (1.3,3.0)	2.5 (1.8,3.6)	2.0 (1.3,3.1)
Household income: <$25K	3.5 (2.1,5.7)	2.8 (1.7,4.6)	2.9 (2.1,4.1)	2.5 (1.8,3.4)	3.0 (2.2,4.2)	2.5 (1.8,3.5)
Household income: <$35K	1.9 (1.1,3.1)	1.2 (0.6,2.3)	2.2 (1.6,3.0)	1.6 (1.1,2.3)	2.2 (1.6,3.1)	1.7 (1.2,2.4)
Household income: <$50K	2.4 (1.5,4.1)	1.9 (1.1,3.2)	2.4 (1.9,3.1)	2.1 (1.6,2.8)	2.5 (2.0,3.3)	2.2 (1.7,2.9)
Household income: <$75K	1.7 (1.1,2.7)	1.5 (0.9,2.4)	1.6 (1.2,2.0)	1.5 (1.1,1.9)	1.7 (1.3,2.2)	1.6 (1.2,2.1)
Household income: ≥$75K	2.1 (1.3,3.2)	1.3 (0.8,2.0)	1.7 (1.4,2.0)	1.5 (1.2,1.9)	1.8 (1.5,2.2)	1.6 (1.2,2.0)
Individual income: Missing	2.2 (1.4,3.7)	2.2 (1.1,4.3)	2.3 (1.8,2.9)	2.7 (1.9,3.7)	2.5 (2.0,3.2)	3.2 (2.3,4.5)
Individual income: <$5K	2.9 (1.8,4.8)	3.4 (2.0,5.8)	2.4 (1.7,3.4)	2.5 (1.7,3.7)	2.4 (1.7,3.3)	2.5 (1.7,3.7)
Individual income: <$10K	2.6 (1.6,4.3)	1.5 (0.9,2.5)	3.0 (2.4,3.9)	2.2 (1.6,3.0)	3.0 (2.3,3.9)	2.2 (1.6,3.1)
Individual income: <$15K	2.6 (1.5,4.5)	1.7 (0.9,3.0)	2.6 (1.9,3.5)	2.0 (1.4,2.9)	2.8 (2.1,3.7)	2.2 (1.5,3.2)
Individual income: <$20K	2.2 (1.4,3.2)	1.8 (1.2,2.8)	1.8 (1.4,2.3)	1.7 (1.4,2.2)	2.0 (1.6,2.6)	1.8 (1.4,2.4)
Individual income: <$35K	2.2 (1.5,3.3)	1.9 (1.3,2.9)	1.7 (1.4,2.1)	1.6 (1.3,1.9)	1.9 (1.6,2.4)	1.7 (1.4,2.2)
Individual income: ≥$35K	1.1 (0.7,1.9)	1.1 (0.7,1.8)	1.4 (1.1,1.8)	1.2 (0.9,1.5)	1.5 (1.2,2.0)	1.3 (1.0,1.7)

Table 3.15. (Continued) United States, by female sex and socioeconomic characteristics – Current asthma prevalence and associations with race, compared to Asians - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/SES	NHOPI Women		White Women		Other Women	
	Current asthma					
	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	2.2 (1.4,3.6)	1.8 (0.9,3.7)	2.3 (1.8,2.9)	2.2 (1.5,3.0)	2.5 (2.0,3.2)	2.6 (1.9,3.7)
PIR: <1	3.2 (2.1,5.0)	3.0 (1.8,5.0)	2.7 (2.0,3.6)	2.4 (1.7,3.4)	2.6 (1.9,3.5)	2.4 (1.7,3.4)
PIR: <2	2.3 (1.5,3.6)	1.4 (0.9,2.3)	2.6 (2.0,3.3)	1.9 (1.5,2.6)	2.7 (2.1,3.4)	2.0 (1.5,2.7)
PIR: <3	1.9 (1.3,2.9)	1.4 (0.9,2.2)	2.1 (1.7,2.7)	1.9 (1.4,2.5)	2.3 (1.8,3.0)	2.0 (1.5,2.6)
PIR: >=3	2.1 (1.5,3.0)	1.6 (1.1,2.3)	1.7 (1.5,1.9)	1.6 (1.4,1.9)	1.8 (1.6,2.1)	1.7 (1.4,2.1)
Composite SES: Missing	2.2 (1.4,3.6)	1.8 (0.9,3.7)	2.3 (1.8,2.9)	2.2 (1.6,3.0)	2.5 (2.0,3.2)	2.6 (1.9,3.7)
Composite SES: Low	2.3 (1.0,5.1)	1.9 (0.9,3.9)	2.1 (1.4,3.2)	1.4 (0.8,2.3)	2.0 (1.3,3.1)	1.3 (0.8,2.2)
Composite SES: Mid	2.4 (1.8,3.0)	1.8 (1.3,2.5)	2.0 (1.7,2.3)	1.6 (1.4,2.0)	2.3 (1.9,2.7)	1.9 (1.6,2.3)
Composite SES: High	1.9 (1.3,2.7)	1.1 (0.8,1.7)	1.9 (1.7,2.2)	1.8 (1.5,2.1)	2.0 (1.7,2.3)	1.7 (1.4,2.1)
Employment: Unemployed	3.5 (2.2,5.5)	2.2 (1.3,3.6)	3.7 (2.7,4.9)	2.1 (1.5,2.9)	3.5 (2.6,4.7)	2.1 (1.5,2.9)
Employment: Other	1.7 (1.2,2.5)	1.3 (0.8,2.2)	1.7 (1.4,2.1)	1.5 (1.2,2.0)	2.0 (1.6,2.4)	1.9 (1.5,2.4)
Employment: Employed	2.3 (1.8,2.9)	1.7 (1.2,2.3)	1.9 (1.7,2.2)	1.7 (1.5,2.0)	2.0 (1.8,2.3)	1.8 (1.5,2.1)
Healthcare cost barrier: Yes	2.3 (1.5,3.7)	2.0 (1.2,3.2)	2.8 (2.1,3.6)	2.1 (1.5,2.8)	2.5 (2.0,3.3)	2.1 (1.5,2.8)
Healthcare cost barrier: No	2.1 (1.7,2.5)	1.4 (1.1,1.9)	1.9 (1.7,2.1)	1.7 (1.4,2.0)	2.2 (1.9,2.4)	1.9 (1.6,2.3)

[a]Adjusted for: Race, region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and race, plus any significant interactions between a covariate, region, and/or race. Models for healthcare cost barrier also included recent healthcare utilization as a covariate but were run only for 2005-2010 data due to missing in the earlier time period.

Table 3.17. United States, by male sex and socioeconomic characteristics – Current asthma prevalence and associations with race, compared to Asians - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/SES:	NHOPI Men		White Men		Other Race Men	
	Current asthma					
	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Education: <High school	1.7 (0.7,3.9)	NA	2.0 (1.2,3.3)	1.1 (0.6,1.8)	1.8 (1.0,3.0)	1.1 (0.6,1.9)
Education: High school	1.9 (1.3,2.7)	NA	1.6 (1.2,2.0)	1.4 (1.0,1.9)	1.7 (1.3,2.1)	1.6 (1.2,2.1)
Education: College	1.5 (1.0,2.5)	NA	1.5 (1.3,1.8)	1.6 (1.3,1.8)	1.4 (1.2,1.7)	1.5 (1.3,1.8)
Household income: Missing	1.8 (0.9,3.7)	NA	1.5 (1.0,2.3)	1.2 (0.7,2.1)	1.6 (1.0,2.5)	1.4 (0.8,2.5)
Household income: <$15K	2.2 (1.0,4.8)	NA	2.5 (1.6,3.7)	1.6 (1.1,2.5)	2.1 (1.4,3.2)	1.4 (0.9,2.2)
Household income: <$25K	1.9 (1.0,3.6)	NA	1.9 (1.3,2.9)	1.9 (1.2,3.2)	1.8 (1.2,2.7)	1.9 (1.2,3.2)
Household income: <$35K	1.6 (0.6,4.1)	NA	1.9 (1.1,3.5)	1.8 (1.0,3.3)	1.8 (1.0,3.2)	1.8 (1.0,3.2)
Household income: <$50K	2.0 (1.0,3.8)	NA	1.4 (1.0,2.0)	1.9 (1.3,2.7)	1.3 (0.9,1.9)	1.8 (1.3,2.7)
Household income: <$75K	1.5 (0.7,3.2)	NA	1.3 (1.0,1.8)	1.2 (0.9,1.7)	1.5 (1.1,2.1)	1.4 (1.0,2.0)
Household income: ≥$75K	1.7 (1.1,2.8)	NA	1.5 (1.3,1.9)	1.5 (1.3,1.9)	1.6 (1.3,1.9)	1.6 (1.3,2.0)
Individual income: Missing	2.1 (1.1,4.1)	NA	1.5 (1.0,2.3)	1.2 (0.7,2.2)	1.6 (1.0,2.5)	1.4 (0.8,2.5)
Individual income: <$5K	1.5 (0.7,3.2)	NA	1.8 (1.2,2.8)	1.4 (0.8,2.4)	1.7 (1.1,2.6)	1.3 (0.8,2.3)
Individual income: <$10K	2.3 (1.2,4.4)	NA	2.6 (1.7,4.0)	4.5 (3.0,6.9)	2.3 (1.5,3.5)	4.2 (2.7,6.4)
Individual income: <$15K	2.4 (1.3,4.7)	NA	1.8 (1.3,2.6)	2.0 (1.3,2.9)	1.7 (1.2,2.5)	2.0 (1.3,3.0)
Individual income: <$20K	2.1 (1.1,4.0)	NA	2.0 (1.5,2.6)	1.8 (1.3,2.4)	2.1 (1.5,2.7)	1.9 (1.4,2.7)
Individual income: <$35K	1.4 (0.8,2.5)	NA	1.3 (1.0,1.7)	1.1 (0.8,1.5)	1.4 (1.1,1.9)	1.3 (0.9,1.7)
Individual income: ≥$35K	1.1 (0.5,2.4)	NA	1.0 (0.8,1.3)	1.2 (1.0,1.6)	0.9 (0.7,1.2)	1.1 (0.8,1.5)

Table 3.16. (Continued) United States, by male sex and socioeconomic characteristics – Current asthma prevalence and associations with race, compared to Asians - Behavioral Risk Factor Surveillance System, 2001-2010.

United States, Stratified by Sex/SES:	NHOPI Men		White Men		Other Race Men	
	Current asthma					
	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Prevalence ratio, PR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
PIR: Missing	2.1 (1.0,4.1)	NA	1.5 (1.0,2.3)	1.2 (0.7,2.2)	1.6 (1.0,2.5)	1.4 (0.8,2.5)
PIR: <1	1.9 (1.0,3.5)	NA	2.0 (1.4,2.9)	1.7 (1.2,2.6)	1.8 (1.2,2.7)	1.6 (1.1,2.4)
PIR: <2	2.0 (1.1,3.6)	NA	2.3 (1.6,3.2)	2.8 (1.9,4.2)	1.9 (1.4,2.8)	2.6 (1.7,4.0)
PIR: <3	2.2 (1.1,4.5)	NA	1.8 (1.3,2.5)	1.9 (1.3,2.8)	1.8 (1.3,2.6)	2.0 (1.4,3.0)
PIR: >=3	1.5 (1.0,2.2)	NA	1.4 (1.2,1.6)	1.4 (1.2,1.7)	1.4 (1.2,1.7)	1.5 (1.2,1.8)
Composite SES: Missing	2.1 (1.0,4.1)	NA	1.5 (1.0,2.4)	1.2 (0.7,2.2)	1.6 (1.0,2.5)	1.4 (0.8,2.5)
Composite SES: Low	1.7 (0.6,4.8)	NA	1.7 (0.9,3.3)	1.0 (0.6,1.7)	1.4 (0.7,2.8)	0.9 (0.6,1.5)
Composite SES: Mid	1.7 (1.2,2.4)	NA	1.6 (1.3,1.9)	1.8 (1.4,2.3)	1.7 (1.4,2.1)	2.0 (1.5,2.5)
Composite SES: High	1.7 (0.9,2.9)	NA	1.6 (1.3,1.9)	1.6 (1.3,1.9)	1.4 (1.2,1.8)	1.5 (1.2,1.9)
Employment: Unemployed	2.3 (1.2,4.4)	NA	2.4 (1.5,3.9)	1.6 (1.0,2.6)	2.2 (1.4,3.6)	1.6 (0.9,2.6)
Employment: Other	1.3 (0.8,2.3)	NA	1.4 (1.1,1.8)	1.4 (1.1,1.9)	1.7 (1.3,2.2)	1.7 (1.3,2.3)
Employment: Employed	1.8 (1.3,2.5)	NA	1.6 (1.4,1.8)	1.7 (1.4,1.9)	1.5 (1.3,1.7)	1.6 (1.4,1.9)
Healthcare cost barrier: Yes	2.4 (1.3,4.3)	NA	2.5 (1.8,3.6)	3.4 (2.4,4.9)	2.3 (1.6,3.3)	3.3 (2.3,4.8)
Healthcare cost barrier: No	2.0 (1.4,2.7)	NA	1.5 (1.3,1.7)	1.5 (1.3,1.7)	1.5 (1.3,1.7)	1.6 (1.3,1.8)

[a]Adjusted for: Race, region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and race, plus any significant interactions between a covariate, region, and/or race. Models for healthcare cost barrier also included recent healthcare utilization as a covariate but were run only for 2005-2010 data due to missing in the earlier time period.

DISCUSSION

This investigation found that during the decade between 2001-2010, racial disparities in asthma prevalence persisted among US NHOPI both after adjustment for sociodemographic characteristics and after controlling for SES using stratification with a variety of SES indicators including education, income, poverty status, education combined with income, employment status, and having a cost barrier to healthcare. That is, elevated asthma prevalence among NHOPI compared to Asians, Whites, and/or those of Other race was not sufficiently explained by differences in geographic region, time, sex, age, BMI, ever-smoking, healthcare access or utilization, nor by the measures of SES utilized by this study. Although not always as great as the excess burden of asthma among NHOPI, elevated asthma prevalence compared to Asians similarly persisted for Whites and those of Other race after statistical multivariable control for sociodemographics and direct control for SES via stratification.

However, this study also found that US asthma disparities by race were modified by level of SES, as well as by sex and/or type of SES measure. Most notably, for White and Other race men, the gap in lifetime asthma prevalence compared to Asians narrowed at lowermost levels of education, individual income, PIR, and composite SES; uniquely, asthma prevalence estimates compared to Asians were no longer demonstrably higher among Whites or Other race men within these lowermost SES categories. For NHOPI, asthma disparities for women were more pronounced at the lowest and highest levels of some SES measures, whereas the largest disparities for NHOPI men tended to occur at middle levels of some SES measures. When added to the adjustment models, sociodemographic characteristics such as healthcare coverage, access, and recent utilization did not change relationships between race and asthma within sex/SES groupings.

In addition, this investigation found that SES has had especially strong and consistent inverse associations with asthma prevalence for Whites. That is, asthma prevalence consistently declined with SES gains among Whites. However, while NHOPI women also exhibited worse asthma prevalence at lowest SES levels, these associations were not significant and some also trended toward more complex non-linear distributions between SES and asthma prevalence. NHOPI men either exhibited no differences in lifetime asthma prevalence between levels of SES (e.g., PIR, employed versus unemployed, and without versus with a healthcare cost barrier), or had somewhat worse prevalence at mid-levels of SES (e.g., education, household and individual income, and composite SES). Asian men who were unemployed and Asian women with a cost barrier to healthcare exhibited substantially worse asthma prevalence than their counterparts with better SES. Otherwise, relationships between asthma and SES among Asians were invariant

or prevalence trended higher at one or both ends of the SES spectrum. Like Whites, those of Other race nearly always reported asthma less often as SES increased, but to a lesser degree than did Whites; for Other race, differentials in asthma prevalence between lower/middle versus uppermost SES levels were often significant, but less than the gradient observed for Whites. These disparate associations between asthma and SES across sex/race subgroups were not meaningfully reduced by adjustment for other sociodemographic factors and were also congruent with observed racial differences in the asthma burden across sex/SES groupings.

In summary, during a past decade of the US asthma epidemic, poverty and/or at least one indicator of lowermost SES has been associated with asthma regardless of race. In some instances, the effect between lowest SES and elevated asthma prevalence was somewhat greater for one or more US racial minorities (e.g., NHOPI women and Asians), but in other instances the effect estimate was greater for Whites. In addition, relationships between lower SES and asthma did not demonstrate a threshold effect. Instead, incremental SES gain corresponded with improved asthma outcomes in a dose-response way invariably for Whites, as well as for those of Other race using most of the SES measures investigated. But unlike Whites, lesser burdens of asthma with gains in SES were not consistently experienced by those of Other race, nor for NHOPI or Asians. Instead, there were many instances in which adjusted asthma prevalence estimates for these population subgroups were elevated at middle, upper, or even uppermost levels of SES (depending on race, sex, SES measure type, and asthma type). Such patterns, in which health-SES associations are inequitable by race, have been previously observed for many health outcomes (62-65), including for asthma (19, 24, 46, 48).

In conclusion, the findings of this investigation suggest that nongenetic and modifiable SES/environmental factors play an important but complex role in US asthma prevalence disparities, including for NHOPI: Asthma prevalence increased over time and the ability of US Census racial categories to predict asthma prevalence was conditional on SES. This adds to a large body of literature demonstrating that single measures of SES as main effects, and/or uses of racial/ethnic categories without recognition of their basis and strong interactions with SES, may fail to sufficiently capture the complex and highly interactive societal factors involved in the differential patterns of preventable diseases observed in the US population by race. That is, this study's findings are consistent with the conclusion that associations between asthma and race are residually confounded by insufficient measures of SES and/or inadequate models of the societal conditions that underlie, operationalize, and interact with racial categorizations; racial differences in SES are not fully captured by typical measures of SES. Additional and more sophisticated systems-level inquiries are instead needed to explain population-level differences

in the incidence and duration of asthma, including among US residents who are well above the poverty line. Rather than reification of race, monitoring social drivers of health aligned with race, combined with investigating effect modifications from many combinations of multiple factors, should enable more effective public health interventions for the elimination of health inequities.

The limitations of this investigation that involve reduced statistical power due to modest sample sizes in some strata, bias from race misclassification, and the self-reported nature of the BRFSS data, have been previously described in studies 1 and 2. Additional limitations include: 1) The utilized asthma outcome measures themselves depend on healthcare usage and/or quality. Such information bias introduces uncertainty regarding how much the observed patterns in prevalence reflect healthcare-related factors rather than the health outcome of interest. However, differences in healthcare along race/SES lines may be an even more important health inequity to document and redress; 2) The interpretation of this study's cross-sectional associations with adult prevalence can be problematic. First, it cannot be determined from these data whether reduced SES causes asthma, or whether poor health with a chronic and potentially debilitating condition such as asthma reduces socioeconomic conditions. However, associations between health outcomes and SES represent public health inequities regardless of the nature or direction of the causes, especially if such associations depend upon the socio-political construct of race. Second, the prevalence metric comprises an interaction between incidence and duration while lacking any information about time; morbidity at middle or older ages cannot be compared among groups if those groups experience different rates of survival or successful disease treatment. This limitation is particularly relevant to current asthma, which can be much reduced with sustained treatment and healthcare-based management. Also, SES and its health impacts are both dynamic and accrue across the lifespan, which limits the utility of measures made at only a single point in time. These limitations that are related to the cross-sectional nature of this investigation could be remedied with measures of asthma incidence instead of prevalence, and with SES measures at different times in the life cycle. However, such resource-intensive approaches are often not practical, necessitating studies such as this one that attempt to glean inferences from available data; 3) Asthma defies easy diagnosis or definition because similar symptoms occur along a spectrum of severity and reflect respiratory disorders of differing, interacting, and often unknown etiologies (1-3, 99). These different disease entities likely differ in their associations with SES and race, and indeed opposite relationships between SES and atopic versus nonatopic asthma have been shown (99). This investigation could therefore be strengthened by the incorporation of additional information that would help to

distinguish asthma phenotypes (e.g., comorbidities such as allergic conditions). 4) This investigation's analyses used the missing-indicator method in which missing income was treated as a separate category of income response. While this method is popular and maximizes sample size, it may also bias estimates (100). Alternative methodologies include complete case analysis or multiple imputation, but these may also bias estimates. To improve this investigation with estimates of bias direction and magnitude, results should be generated and compared using all three missing data approaches.

Despite these limitations, this study contributes one of the few studies of asthma racial disparities to take into account both SES and its interactions with race, and the only study to do so for any chronic disease with excess impacts on US NHOPI. There have long been calls for such disaggregation of data on NHOPI from Asian populations (77, 78), which is now made possible by the consistent nationwide and multi-year BRFSS resource that implemented this mandate. Finally, this study is also strengthened by use of multiple SES measure types, each of which likely reflect different points along a complex and continuous spectrum of a variety of life course exposures.

STUDY 4: DOMINANT PREDICTORS OF ADULT ASTHMA PREVALENCE VARY BY SEX, RACE, AND SOCIOECONOMIC STATUS IN THE UNITED STATES

INTRODUCTION

As demonstrated in studies 1 thru 3, to affect national-level progress toward asthma reduction and related health equity goals successes are needed broadly and across all levels of SES. However, there is also urgent need for prevention of asthma especially among the socially disadvantaged, including some racial/ethnic minorities such as NHOPI who have particularly grievous yet preventable disease burdens and mortality (26, 34, 36, 53, 54, 57, 58).

Myriad asthma associations and their relative strengths have been well-documented, with many well-established risk factors known (e.g., female sex, young age, obesity, smoking, and aspects of healthcare), but with many associations less well-understood (e.g., time periods, western and northeastern US regions, race/ethnicity, and lower SES) (5-8, 12, 13, 18-24, 30, 52). Multivariable regression models are frequently used to determine the relative strengths of these asthma associations, as well as the magnitude of excess asthma among different subpopulations, while controlling for potential confounders. Prevention programs often target the strongest risk factors and/or the subpopulations that exhibit the most elevated adjusted asthma prevalence.

However, a factor's comparative strength of association from a multiple regression analysis does not necessarily reflect its ability to predict asthma, because factors are often highly correlated. That is, model coefficients are context-dependent and change depending on other included covariates. Indeed, a covariate can exhibit little or no association with the modelled outcome but can yet be a very good predictor of the outcome. Therefore, ranked magnitudes of adjusted odds or prevalence ratios derived from regression coefficients are *not* indicators of relative importance, when 'importance' refers to predictive ability (i.e., the amount of outcome variance explained) – although such estimates and/or their *p*-values may be both misleadingly and commonly portrayed as indicative of effect 'importance' in the epidemiologic literature.

Instead, covariate 'importance' may be derived from predictive ability in a multivariable regression model *and all subsets of that model*, as measured by model goodness-of-fit. Such a definition of importance will account for collinearity that frequently exists between factors. Rooted in decision theory, dominance analysis provides both a straightforward method and summary statistics for evaluating covariate importance. Dominance analysis is also a highly recommended but often neglected adjunct to traditional multiple regression analyses (101-105).

The distinction between covariate association strength versus explanatory importance is highly relevant for applied epidemiologic research because programs aimed at reducing asthma

may benefit not only from targeting specific subpopulations with high prevalence, but also from prioritizing the most influential asthma risk factors within those groups. However, the comparative explanatory importance of factors involved in US racial and/or SES disparities in asthma has not yet been investigated using dominance analysis.

With particular interest in the substantial racial and SES disparities in asthma among NHOPI, Whites, and Asians in the US (12, 26, 53, 54), this investigation asked: 'Given the existence of many asthma risk factors, combined with their interconnected relationships both within and across subpopulations defined by sex, race, and/or SES – which asthma predictors are the most important for different sex/race or sex/SES groups?; do these factors have the same relative predictive ability for asthma among different races?; do these factors make the same relative explanatory contributions to the prediction of asthma among different levels of SES?'

Specifically, with data from a large and nationally-representative US health survey, the aims of this investigation were to: 1) Review sociodemographic associations with asthma observed in this dataset, for US race subpopulations comprised of NHOPI, White, Asian, or Other races, by sex, after adjustment for sociodemographic and SES characteristics; 2) similarly quantify and summarize adjusted sociodemographic and racial asthma associations, for subpopulations defined by level of SES and sex; 3) determine which factors are the most important in predicting asthma within each of these racial and SES subpopulations, using dominance analysis; 4) compare the relative importance of dominant asthma predictors to their relative strengths of association with asthma.

METHODS

The complete details of the utilized BRFSS national health survey for 2001-2010, including the asthma outcomes, race definitions, and sociodemographic covariates predictive of asthma prevalence were the same as described for studies 1 and 3. The SES-representative categorical variable of education attainment (i.e., less than a high school diploma, high school graduation, or college graduation) was selected for this analysis because it is one of the most widely used SES indicators and may be less affected by the asthma outcomes themselves (97). In contrast to study 3, the asthma prevalence adjustment model utilized in this study included only main effects, due to the inability of dominance analysis to include model interaction terms; inclusion of interaction terms for US region and race did not meaningfully alter the strengths of most asthma associations within groupings by sex/race or sex/education (data not shown).

To determine whether a covariate's relative ability to explain elevated asthma prevalence varied by race, dominance analyses were conducted within all sex/race subpopulations, for lifetime and current asthma. Similarly, to investigate whether the SES indicator of education attainment modified the relative importance of the other sociodemographic asthma prevalence predictors (including race), dominance analyses were conducted within all sex/education subpopulations.

Dominance Analysis Definitions and Methodology

Dominance analysis quantifies and compares the contribution of each covariate to the chosen model, for all submodels; it thereby accounts for each covariate's ability to predict the outcome directly, as well as conditionally on all subsets of the other covariates (101-104). To investigate the relative predictive importance among the correlated covariates of this study's selected logistic regression model of asthma prevalence, dominance analyses were conducted using the procedure described by Azen and Traxel, 2009 (102, 104). Specifically, the 255 unique submodels possible for this study's eight covariates (i.e., region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and either race or education attainment) were fit to each outcome (lifetime or current asthma). For each outcome, this involved eight base submodels (k=1, s_1=8; k=2, s_2=28; k=3, s_3=56; k=4, s_4=70; k=5, s_5=56; k=6, s_6=28; k=7, s_7=8; k=8, s_8=1), where k is the number of included covariates in the base submodel, and s_k is the number of unique submodels of size k (Appendix Table 5.16 describes the analysis plan, after Table 2 in Azen & Traxel (2009)).

Goodness of logistic regression model fit was quantified using the analogue R^2 of McFadden that is based on the likelihood ratio (104, 106). The additional contribution that a covariate makes to the fit of a base submodel was quantified using the difference in McFadden R^2 between the submodel with the covariate versus without. Larger differences in the McFadden R^2 indicated greater improvement in model predictive ability. The relative importance of each of the eight covariates was then ranked according to the amount by which it improved the predictive ability of each of the base submodels; a covariate that consistently explained more than any other covariate in all subsets of a base model was classified as 'completely dominant.'

The eight covariates were also ranked at each of the eight k-levels according to the mean amount the covariate contributed to submodel fits (M_{ik}); a covariate (i) was 'conditionally dominant' over another (j) if its average explanatory rank was greater at every k-level (i.e., $M_{ik} > M_{jk}$). Additionally, each covariate was assessed for 'general dominance' using the overall average of its k-level mean contributions to submodel fit:

$$D_i = (\sum M_{ik})/8$$

To assess the magnitude of general dominance of one covariate (i) over another (j), the difference was taken between each covariate's overall average k-level mean predictive contribution:

$$G_{ij} = D_i - D_j$$

General dominance was considered meaningful when $G_{ij} \geq 0.01$; Azen & Traxel (2009) demonstrated that this magnitude of G_{ij} yielded general dominance reproducibility of more than 70%, using bootstrap of data from a small self-report health survey (102, 104). Statistical significance for general dominance was set at $G_{ij} \geq 0.02$, which yielded reproducibility values greater than 95% in the Azen & Traxel (2009) empirical investigation (104).

Lastly, using the relationship that the sum of the overall averages of all covariate k-level mean contributions to submodel fits is equal to the full model's McFadden R^2,

$$R^2_{\text{full model}} = \sum D_i$$

the summary magnitude of the predictive contribution of each covariate in the final model was additionally quantified as a percentage of the final model's fit.

RESULTS

United States Sample and Population Characteristics By Sex and Race, and By Sex and Socioeconomic Status

Descriptive statistics for the 2001-2010 BRFSS dataset for US overall, which comprised over 3 million records, were described in studies 1 and 3.

There were substantial socioeconomic differences by race (Appendix Tables 5.11 thru 5.15). In addition, differences among the three subpopulations defined by education attainment were also numerous for characteristics relevant to asthma (data not shown). For example, young (18-34 years) females were more likely to be college graduates compared to males, while older (≥ 65 years) females were more likely to have less than a high school degree. However, at middle age there were only small differences in education attainment between sexes. Obesity was most prevalent among those who reported the lowest level of education and especially so for females,

while college graduate males reported overweight more often than males reporting less education. Having ever smoked declined consistently with education attainment among males, whereas high school graduate females reported ever-smoking more often than females not having a high school degree. However, college graduate females were less likely to be ever-smokers than college graduate males. Proportions of those having either healthcare coverage or provider increased in a dose-response manner with education level.

Relative Strengths of Associations with Asthma Prevalence in the United States, By Sex and Race

The magnitudes of observed crude and adjusted associations between asthma prevalence and racial, sociodemographic, and SES characteristics within this national dataset, both overall and within subgroups defined by sex and race, were presented in studies 1 and 3. In study 3, adjustment of asthma prevalence estimates included both main and interaction effects for education attainment, as well as for other sociodemographic characteristics including region. In this investigation, adjustment of asthma prevalence estimates included only main effects. However, these differences in predictive models did not meaningfully alter previous findings regarding racial asthma disparities and racial differences in sociodemographic asthma associations (Tables 4.1 thru 4.4). In review: Race modified associations between asthma and a variety of SES indicators, with only Whites and women of Other race experiencing consistent gradients of declining asthma prevalence between the lower- and upper-most levels of SES, including after adjustment for potential confounders. For the SES measure of education, estimates of asthma prevalence were lowest among those with the highest education attainment, except among Asian females and NHOPI males reporting an asthma ever-diagnosis.

Table 4.1. United States, women by race – Lifetime asthma associations, adjusted for sociodemographic and education characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Women – Lifetime asthma			
	NHOPI	Asian	White	Other Race
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	1.6 (1.1,2.3)	1.7 (1.4,2.1)	1.3 (1.2,1.4)	1.4 (1.2,1.6)
Region: West	1.6 (1.0,2.4)	1.4 (1.1,1.8)	1.2 (1.1,1.2)	1.3 (1.2,1.4)
Region: Midwest	1.5 (0.9,2.4)	1.1 (0.9,1.4)	1.0 (1.0,1.0)	1.2 (1.2,1.3)
Region: Northeast	1.3 (0.8,2.1)	1.0 (0.8,1.3)	1.1 (1.1,1.1)	1.3 (1.3,1.4)
Region: South	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	0.9 (0.7,1.3)	1.1 (0.9,1.4)	1.1 (1.0,1.1)	1.1 (1.0,1.1)
Time period: 2005-2007	1.0 (0.8,1.5)	1.1 (0.9,1.4)	1.0 (1.0,1.1)	1.0 (1.0,1.1)
Time period: 2001-2003	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	1.0 (0.7,1.7)	1.4 (1.0,1.8)	1.5 (1.5,1.6)	1.4 (1.3,1.5)
Age: 35-64 years	1.0 (0.6,1.5)	1.2 (0.9,1.5)	1.2 (1.2,1.2)	1.2 (1.1,1.3)
Age: >=65 years	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
BMI: Obese	1.4 (1.1,1.9)	1.8 (1.5,2.2)	1.7 (1.6,1.7)	1.6 (1.5,1.6)
BMI: Overweight	1.0 (0.8,1.4)	1.3 (1.1,1.6)	1.2 (1.1,1.2)	1.1 (1.1,1.2)
BMI: Not OW/OB	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Smoke: Ever	1.5 (1.2,1.9)	1.5 (1.2,1.8)	1.3 (1.3,1.3)	1.4 (1.3,1.4)
Smoke: Never	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	1.5 (1.0,2.1)	1.3 (0.9,1.8)	1.0 (1.0,1.0)	1.2 (1.1,1.2)
Healthcare coverage: No	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)

Table 4.1. (Continued) United States, women by race – Lifetime asthma associations, adjusted for sociodemographic and education characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Women – Lifetime asthma			
	NHOPI	Asian	White	Other Race
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	1.3 (0.8,2.0)	1.5 (1.2,1.9)	1.3 (1.2,1.3)	1.2 (1.2,1.3)
Healthcare provider: No	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Education: <High school	1.2 (0.7,2.0)	0.9 (0.6,1.3)	1.2 (1.1,1.2)	1.2 (1.1,1.2)
Education: High school	1.0 (0.8,1.4)	1.0 (0.9,1.2)	1.0 (1.0,1.0)	1.1 (1.0,1.1)
Education: College	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and education.				

Table 4.2. United States, men by race – Lifetime asthma associations, adjusted for sociodemographic and education characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Men – Lifetime asthma			
	NHOPI	Asian	White	Other Race
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	1.4 (0.9,2.0)	1.8 (1.4,2.3)	1.1 (1.0,1.2)	1 (0.8,1.3)
Region: West	1.4 (0.9,2.2)	1.3 (1.0,1.7)	1.1 (1.1,1.2)	1 (0.9,1.1)
Region: Midwest	1.2 (0.7,2.2)	1.1 (0.8,1.5)	1 (1.0,1.0)	1.3 (1.2,1.4)
Region: Northeast	1 (0.6,1.7)	1 (0.8,1.4)	1.1 (1.0,1.1)	1.1 (1.0,1.2)
Region: South	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	1.2 (0.8,1.8)	1.4 (1.1,1.8)	1.2 (1.1,1.2)	1.1 (1.1,1.2)
Time period: 2005-2007	1.7 (1.1,2.5)	1.2 (0.9,1.6)	1.1 (1.1,1.1)	1 (0.9,1.1)
Time period: 2001-2003	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	1.2 (0.6,2.5)	1.4 (1.0,1.9)	1.8 (1.7,1.9)	1.8 (1.6,2.0)
Age: 35-64 years	0.8 (0.4,1.7)	0.8 (0.6,1.1)	1.1 (1.1,1.2)	1.1 (1.0,1.2)
Age: >=65 years	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
BMI: Obese	1.7 (1.1,2.5)	2 (1.5,2.6)	1.2 (1.2,1.3)	1.1 (1.1,1.2)
BMI: Overweight	1.2 (0.8,1.8)	1.1 (0.9,1.3)	0.9 (0.9,1.0)	0.9 (0.8,1.0)
BMI: Not OW/OB	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Smoke: Ever	1.4 (1.0,1.9)	0.9 (0.7,1.1)	1.1 (1.1,1.2)	1.2 (1.1,1.3)
Smoke: Never	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	1 (0.7,1.5)	1.1 (0.8,1.6)	1 (0.9,1.0)	1.1 (1.0,1.1)
Healthcare coverage: No	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)

Table 4.2. (Continued) United States, men by race – Lifetime asthma associations, adjusted for sociodemographic and education characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Men – Lifetime asthma			
	NHOPI	Asian	White	Other Race
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	1 (0.7,1.5)	1.3 (1.0,1.7)	1.4 (1.3,1.4)	1.3 (1.2,1.5)
Healthcare provider: No	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Education: <High school	0.8 (0.4,1.6)	1.2 (0.7,1.9)	1.1 (1.1,1.1)	1.1 (1.0,1.2)
Education: High school	1.4 (1.0,2.1)	1.1 (0.9,1.4)	1 (1.0,1.0)	1.1 (1.1,1.2)
Education: College	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and education.				

Table 4.3. United States, women by race – Current asthma associations, adjusted for sociodemographic and education characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Women – Current asthma			
	NHOPI	Asian	White	Other Race
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	2.5 (1.7,3.6)	1.8 (1.4,2.4)	1.2 (1.1,1.3)	1.3 (1.1,1.6)
Region: West	2.3 (1.5,3.7)	1.5 (1.1,2.0)	1.1 (1.1,1.2)	1.3 (1.2,1.4)
Region: Midwest	2 (1.1,3.4)	1.4 (1.0,2.0)	1.0 (1.0,1.1)	1.3 (1.2,1.4)
Region: Northeast	2.4 (1.4,4.2)	1.2 (0.9,1.7)	1.1 (1.1,1.1)	1.4 (1.3,1.5)
Region: South	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	0.7 (0.5,1.1)	1.1 (0.8,1.4)	1.0 (1.0,1.1)	1.0 (1.0,1.1)
Time period: 2005-2007	0.8 (0.6,1.3)	1.1 (0.8,1.4)	1.0 (1.0,1.0)	1.0 (0.9,1.1)
Time period: 2001-2003	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	1.2 (0.6,2.3)	1.0 (0.7,1.4)	1.4 (1.4,1.4)	1.4 (1.3,1.5)
Age: 35-64 years	1.2 (0.6,2.4)	1.0 (0.8,1.4)	1.2 (1.2,1.2)	1.3 (1.2,1.3)
Age: >=65 years	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
BMI: Obese	1.7 (1.2,2.6)	2.5 (2.0,3.2)	1.9 (1.8,1.9)	1.7 (1.6,1.8)
BMI: Overweight	1.4 (0.9,2.1)	1.7 (1.3,2.1)	1.2 (1.2,1.2)	1.1.0 (1.1,1.2)
BMI: Not OW/OB	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Smoke: Ever	1.6 (1.1,2.2)	1.2 (0.9,1.4)	1.4 (1.3,1.4)	1.5 (1.4,1.5)
Smoke: Never	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	1.3 (0.8,2.0)	1.3 (0.9,1.8)	1.0 (1.0,1.0)	1.2 (1.1,1.3)
Healthcare coverage: No	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)

Table 4.3. (Continued) United States, women by race – Current asthma associations, adjusted for sociodemographic and education characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Women – Current asthma			
	NHOPI	Asian	White	Other Race
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	1.4 (0.9,2.4)	1.8 (1.3,2.5)	1.4 (1.4,1.5)	1.3 (1.2,1.4)
Healthcare provider: No	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
Education: <High school	1.3 (0.6,2.5)	1.0 (0.7,1.4)	1.3 (1.3,1.4)	1.4 (1.3,1.5)
Education: High school	1.1.0 (0.8,1.7)	1.1.0 (0.9,1.4)	1.1.0 (1.0,1.1)	1.2 (1.1,1.3)
Education: College	1.0 (ref)	1.0 (ref)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and education.				

Table 4.4. United States, men by race – Current asthma associations, adjusted for sociodemographic and education characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Men – Current asthma			
	NHOPI	Asian	White	Other Race
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Region: Hawai'i	NA	1.7 (1.3,2.3)	1.0 (0.9,1.1)	0.8 (0.6,1.1)
Region: West	NA	1.4 (1.0,2.0)	1.2 (1.1,1.2)	1.1 (0.9,1.2)
Region: Midwest	NA	1.2 (0.8,1.9)	1.1 (1.1,1.2)	1.4 (1.2,1.5)
Region: Northeast	NA	1.4 (1.0,2.1)	1.2 (1.1,1.2)	1.2 (1.1,1.3)
Region: South	NA	1.0 (ref)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	NA	1.2 (0.8,1.7)	1.1 (1.1,1.2)	1.2 (1.0,1.3)
Time period: 2005-2007	NA	1.0 (0.7,1.4)	1.1 (1.0,1.1)	1.0 (0.9,1.1)
Time period: 2001-2003	NA	1.0 (ref)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	NA	0.8 (0.6,1.2)	1.4 (1.3,1.4)	1.4 (1.2,1.6)
Age: 35-64 years	NA	0.7 (0.5,1.0)	1.0 (1.0,1.0)	1.0 (0.9,1.1)
Age: >=65 years	NA	1.0 (ref)	1.0 (ref)	1.0 (ref)
BMI: Obese	NA	2.3 (1.5,3.4)	1.3 (1.2,1.4)	1.2 (1.1,1.3)
BMI: Overweight	NA	1.0 (0.8,1.4)	0.9 (0.9,1.0)	0.9 (0.8,1.0)
BMI: Not OW/OB	NA	1.0 (ref)	1.0 (ref)	1.0 (ref)
Smoke: Ever	NA	0.8 (0.6,1.1)	1.2 (1.1,1.2)	1.2 (1.1,1.3)
Smoke: Never	NA	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	NA	1.5 (1.0,2.4)	0.9 (0.9,1.0)	0.9 (0.9,1.1)
Healthcare coverage: No	NA	1.0 (ref)	1.0 (ref)	1.0 (ref)

Table 4.4. (Continued) United States, men by race – Current asthma associations, adjusted for sociodemographic and education characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Men – Current asthma			
	NHOPI	Asian	White	Other Race
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Healthcare provider: Yes	NA	1.3 (0.9,1.9)	1.6 (1.6,1.7)	1.7 (1.5,1.9)
Healthcare provider: No	NA	1.0 (ref)	1.0 (ref)	1.0 (ref)
Education: <High school	NA	1.1 (0.6,1.9)	1.3 (1.3,1.4)	1.4 (1.2,1.6)
Education: High school	NA	1.0 (0.8,1.4)	1.1 (1.0,1.1)	1.3 (1.1,1.4)
Education: College	NA	1.0 (ref)	1.0 (ref)	1.0 (ref)
[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and education.				

Dominant Asthma Predictors in the United States, By Sex and Race

The relative abilities of covariates to explain asthma prevalence varied by both sex and race (Tables 4.5 and 4.6). BMI was the most important predictor of both lifetime and current asthma among White and Other race females (on average explaining 54% of the variance in current asthma among Whites, and 35% of current asthma among Other race). BMI also had the greatest predictive ability for current asthma among Asians of both sexes (substantially explaining 51% for females, 43% for males), and had secondary general dominance for lifetime asthma. Moreover, among White and Other race females, and all Asians with current asthma, BMI made the greatest average explanatory contribution in every set of submodels of the same size (i.e., BMI was conditionally dominant). BMI also ranked as the second-most important predictor of lifetime asthma for NHOPI males and ranked as the third-most important covariate among NHOPI females for both lifetime and current asthma.

Unlike White and Other race females, the most important predictors of asthma among NHOPI females were ever-smoking and US region; as a predictive covariate of current asthma, region was completely dominant (i.e., region made the greatest predictive contribution in all submodels), and also had the strongest adjusted prevalence ratio estimates (Tables 4.5 and 4.6). Among Asian females, region was also the best on-average predictor of ever-diagnosis with asthma. Having ever smoked was the second most important predictor of asthma among Other race females.

For males of White, Asian, and Other race, age was the most important explanatory factor of lifetime asthma, being completely dominant and predicting more for Whites (56%) and Other race (48%) than for Asians (29%) (Tables 4.5 and 4.6). For current asthma, no one covariate was meaningfully more predictive among White males, while having a healthcare provider was a conditionally dominant covariate among Other race males. Uniquely, the time period of the survey best explained lifetime asthma prevalence among NHOPI males. Also, the SES indicator of education attainment was uniquely and generally dominant (explaining 20% of lifetime asthma) among male NHOPI.

In sex/race subpopulations, the relative importance of BMI from dominance analyses was congruent with its relative rank in strengths of association with asthma prevalence. Otherwise, dominance analyses augmented the multivariable regression results by enabling distinctions in asthma predictive ability between covariates with similar asthma association strengths. For example, adjusted lifetime asthma prevalence ratios for ever-smoking and healthcare coverage were similar among NHOPI females (both with aPR=1.5), but dominance analysis indicated that ever-smoking played a more influential role in predicting an asthma

ever-diagnosis than did healthcare coverage in this subgroup. For NHOPI males, dominance analysis distinguished education attainment as a more important predictor of lifetime asthma than ever-smoking, or residence in Hawai'i or western states (all with aPR=1.4). For Asian males, age was a greater contributor to the model than obesity (aPR=2.0) or residence in Hawai'i (aPR=1.8), despite a much weaker associations between age and lifetime asthma.

Table 4.5. United States, women by race - Dominant predictors of asthma prevalence - Behavioral Risk Factor Surveillance System, 2001-2010.

	Women							
Dominance Rank	**Lifetime asthma Dominant Covariates & Percent of Asthma Explained**							
	NHOPI		**Asian**		**White**		**Other Race**	
1st	Smoking	31%	Region	25%	BMI[b]	47%	BMI[b]	33%
2nd	Region	26%	BMI	25%	None	NA	Smoking[b]	24%
3rd	BMI[b]	19%	None	NA	None	NA	None	NA
	Current asthma Dominant Covariates & Percent of Asthma Explained							
	NHOPI		**Asian**		**White**		**Other Race**	
1st	Region[a]	36%	BMI[b]	51%	BMI[b]	54%	BMI[b]	35%
2nd	Smoking	20%	None	NA	None	NA	Smoking[b]	23%
3rd	BMI	20%	None	NA	None	NA	None	NA
a: Completely dominant; b: Conditionally dominant								

Table 4.6. United States, men by race - Dominant predictors of asthma prevalence - Behavioral Risk Factor Surveillance System, 2001-2010.

	Men							
Dominance Rank	**Lifetime asthma Dominant Covariates & Percent of Asthma Explained**							
	NHOPI		**Asian**		**White**		**Other Race**	
1st	Time period	23%	Age	29%	Age[a]	56%	Age[a]	48%
2nd	BMI	23%	BMI	28%	None	NA	None	NA
3rd	Education	20%	None	NA	None	NA	None	NA
	Current asthma Dominant Covariates & Percent of Asthma Explained							
	NHOPI		**Asian**		**White**		**Other Race**	
1st	NA	NA	BMI[b]	43%	None	NA	Healthcare provider[b]	38%
2nd	NA	NA	None	NA	None	NA	None	NA
3rd	NA	NA	None	NA	None	NA	None	NA
a: Completely dominant; b: Conditionally dominant								

Relative Strengths of Associations with Asthma Prevalence in the United States, By Sex and SES

Among subpopulations defined by sex and level of SES as indicated by one of three different levels of education attainment, elevated asthma prevalence as compared to Asians was found in study 3 to persist among NHOPI, Whites, and those of Other race, including after multivariable adjustment, except among males who reported the lowest level of education. In addition, there was a notable racial disparity in adjusted lifetime asthma among high school graduate males, with NHOPI males not only reporting asthma ever-diagnoses more frequently than Asians, but also more frequently than White or Other race (Tables 4.7 thru 4.10).

Adjusted asthma prevalence increased with time only for males, and marginally increased with time more so for those without a college degree (Tables 4.7 thru 4.10). Asthma associations with younger age were modified by sex, but not by SES as indicated by education attainment. Associations between adjusted asthma prevalence and the risk factors of obesity and ever-smoking were strongest for females regardless of education level. However, as education level increased the strength of asthma associations with obesity also marginally increased. In contrast, asthma associations with ever-smoking markedly decreased with greater education attainment; ever-smoking was strongly associated with asthma prevalence within the lowest level of education but was not associated within the highest education level. Having healthcare coverage predicted asthma only among those with less than a high school education, with stronger associations among females. Having a healthcare provider was most strongly associated with asthma prevalence among those without a high school degree, with stronger associations among males.

Also among sex/education strata, this investigation found that the largest geographic differences in asthma prevalence were between Hawai‘i and the South, and between the western region as compared to the South, with adjusted asthma prevalence highest among high school and college graduate females who resided in Hawai‘i (Tables 4.7 thru 4.10). Moreover, the degree to which asthma was elevated in Hawai‘i marginally increased with education level regardless of sex. However, those with the least education reported asthma less often in the West than in the South after adjusting for potential confounders, especially among males.

Table 4.7. United States, women by education attainment – Lifetime asthma associations, adjusted for race and sociodemographic characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Women – Lifetime asthma		
	< High school	High school graduate	College graduate
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Race: NHOPI	1.9 (1.1,3.2)	1.6 (1.3,2.0)	1.7 (1.3,2.3)
Race: White	1.5 (1.0,2.1)	1.4 (1.2,1.7)	1.6 (1.4,1.7)
Race: Other	1.5 (1.1,2.2)	1.6 (1.4,1.8)	1.6 (1.4,1.8)
Race: Asian	1.0 (ref)	1.0 (ref)	1.0 (ref)
Region: Hawai‘i	1.1 (0.9,1.4)	1.5 (1.4,1.6)	1.5 (1.4,1.7)
Region: West	0.9 (0.8,1.0)	1.3 (1.2,1.3)	1.3 (1.3,1.4)
Region: Midwest	1.0 (1.0,1.1)	1.1 (1.0,1.1)	1.0 (1.0,1.1)
Region: Northeast	1.1 (1.0,1.2)	1.1 (1.1,1.2)	1.2 (1.1,1.2)
Region: South	1.0 (ref)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	1.0 (1.0,1.1)	1.1 (1.1,1.1)	1.0 (1.0,1.1)
Time period: 2005-2007	1.0 (1.0,1.1)	1.0 (1.0,1.1)	1.0 (1.0,1.1)
Time period: 2001-2003	1.0 (ref)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	1.4 (1.3,1.5)	1.6 (1.5,1.6)	1.4 (1.4,1.5)
Age: 35-64 years	1.3 (1.2,1.4)	1.3 (1.2,1.3)	1.2 (1.1,1.2)
Age: >=65 years	1.0 (ref)	1.0 (ref)	1.0 (ref)
BMI: Obese	1.5 (1.4,1.6)	1.6 (1.6,1.7)	1.7 (1.6,1.7)
BMI: Overweight	1.1 (1.0,1.1)	1.1 (1.1,1.2)	1.3 (1.2,1.3)
BMI: Not OW/OB	1.0 (ref)	1.0 (ref)	1.0 (ref)
Smoke: Ever	1.9 (1.8,2.0)	1.3 (1.3,1.3)	1.1 (1.1,1.1)
Smoke: Never	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	1.3 (1.3,1.4)	1.0 (1.0,1.0)	0.9 (0.9,1.0)
Healthcare coverage: No	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	1.5 (1.3,1.6)	1.2 (1.2,1.3)	1.3 (1.2,1.3)
Healthcare provider: No	1.0 (ref)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and race.

Table 4.8. United States, men by education attainment – Lifetime asthma associations, adjusted for race and sociodemographic characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Men – Lifetime asthma		
	< High school	High school graduate	College graduate
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Race: NHOPI	1.1 (0.5,2.4)	1.8 (1.4,2.4)	1.5 (1.1,2.1)
Race: White	1.1 (0.7,1.9)	1.3 (1.1,1.5)	1.5 (1.3,1.6)
Race: Other	1.1 (0.6,1.8)	1.4 (1.2,1.7)	1.5 (1.3,1.7)
Race: Asian	1.0 (ref)	1.0 (ref)	1.0 (ref)
Region: Hawai‘i	1.1 (0.8,1.5)	1.3 (1.2,1.5)	1.4 (1.3,1.6)
Region: West	0.7 (0.6,0.8)	1.2 (1.1,1.2)	1.3 (1.3,1.4)
Region: Midwest	1.1 (1.0,1.2)	1.0 (1.0,1.1)	1.0 (1.0,1.1)
Region: Northeast	1.0 (0.9,1.1)	1.1 (1.0,1.1)	1.1 (1.1,1.2)
Region: South	1.0 (ref)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	1.2 (1.1,1.3)	1.2 (1.1,1.2)	1.1 (1.1,1.2)
Time period: 2005-2007	1.2 (1.1,1.3)	1.1 (1.0,1.1)	1.1 (1.0,1.2)
Time period: 2001-2003	1.0 (ref)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	1.8 (1.6,1.9)	1.9 (1.8,2.0)	1.6 (1.5,1.7)
Age: 35-64 years	1.2 (1.1,1.3)	1.2 (1.1,1.2)	1.1 (1.1,1.2)
Age: >=65 years	1.0 (ref)	1.0 (ref)	1.0 (ref)
BMI: Obese	1.2 (1.1,1.3)	1.2 (1.2,1.3)	1.3 (1.2,1.4)
BMI: Overweight	0.8 (0.8,0.9)	0.9 (0.9,1.0)	1.0 (1.0,1.1)
BMI: Not OW/OB	1.0 (ref)	1.0 (ref)	1.0 (ref)
Smoke: Ever	1.4 (1.3,1.5)	1.1 (1.1,1.2)	1.0 (1.0,1.1)
Smoke: Never	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	1.2 (1.1,1.3)	1 (0.9,1.0)	1.0 (0.9,1.1)
Healthcare coverage: No	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	1.5 (1.4,1.7)	1.3 (1.3,1.4)	1.3 (1.3,1.4)
Healthcare provider: No	1.0 (ref)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and race.

Table 4.9. United States, women by education attainment – Current asthma associations, adjusted for race and sociodemographic characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Women – Current asthma		
	< High school	High school graduate	College graduate
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Race: NHOPI	2.0 (1.1,3.9)	1.8 (1.4,2.3)	1.7 (1.2,2.5)
Race: White	1.8 (1.2,2.5)	1.7 (1.4,2.0)	1.8 (1.6,2.1)
Race: Other	1.8 (1.3,2.6)	1.9 (1.6,2.3)	1.9 (1.6,2.2)
Race: Asian	1.0 (ref)	1.0 (ref)	1.0 (ref)
Region: Hawai‘i	1.0 (0.8,1.4)	1.4 (1.3,1.5)	1.6 (1.5,1.8)
Region: West	0.8 (0.7,0.9)	1.2 (1.2,1.3)	1.3 (1.3,1.4)
Region: Midwest	1.0 (1.0,1.1)	1.1 (1.1,1.2)	1.1 (1.1,1.1)
Region: Northeast	1.1 (1.0,1.2)	1.2 (1.2,1.2)	1.2 (1.2,1.3)
Region: South	1.0 (ref)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	1.1 (1.0,1.1)	1.1 (1.0,1.1)	1.0 (1.0,1.0)
Time period: 2005-2007	1.0 (0.9,1.1)	1.0 (1.0,1.1)	1.0 (0.9,1.0)
Time period: 2001-2003	1.0 (ref)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	1.3 (1.2,1.4)	1.5 (1.4,1.5)	1.3 (1.3,1.4)
Age: 35-64 years	1.4 (1.3,1.5)	1.3 (1.2,1.3)	1.2 (1.1,1.2)
Age: >=65 years	1.0 (ref)	1.0 (ref)	1.0 (ref)
BMI: Obese	1.6 (1.5,1.7)	1.8 (1.8,1.9)	1.9 (1.8,2.0)
BMI: Overweight	1.1 (1.0,1.1)	1.2 (1.1,1.2)	1.3 (1.3,1.4)
BMI: Not OW/OB	1.0 (ref)	1.0 (ref)	1.0 (ref)
Smoke: Ever	2.0 (1.9,2.1)	1.4 (1.3,1.4)	1.1 (1.0,1.1)
Smoke: Never	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	1.4 (1.3,1.5)	1 (1.0,1.1)	1 (0.9,1.0)
Healthcare coverage: No	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	1.6 (1.4,1.7)	1.4 (1.3,1.4)	1.4 (1.3,1.5)
Healthcare provider: No	1.0 (ref)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and race.

Table 4.10. United States, men by education attainment – Current asthma associations, adjusted for race and sociodemographic characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Men – Current asthma		
	< High school	High school graduate	College graduate
	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)	Adjusted[a] prevalence ratio, aPR (95%CI)
Race: NHOPI	1.4 (0.6,3.5)	1.8 (1.3,2.6)	1.3 (0.8,2.2)
Race: White	1.5 (0.9,2.6)	1.6 (1.3,2.1)	1.5 (1.3,1.8)
Race: Other	1.5 (0.9,2.5)	1.8 (1.4,2.3)	1.5 (1.2,1.7)
Race: Asian	1.0 (ref)	1.0 (ref)	1.0 (ref)
Region: Hawai‘i	1.0 (0.7,1.5)	1.3 (1.1,1.5)	1.2 (1.1,1.4)
Region: West	0.6 (0.5,0.7)	1.2 (1.2,1.3)	1.4 (1.3,1.5)
Region: Midwest	1.2 (1.1,1.3)	1.1 (1.1,1.2)	1.2 (1.1,1.3)
Region: Northeast	1.1 (1.0,1.2)	1.2 (1.1,1.2)	1.3 (1.2,1.4)
Region: South	1.0 (ref)	1.0 (ref)	1.0 (ref)
Time period: 2008-2010	1.2 (1.1,1.4)	1.2 (1.1,1.2)	1.1 (1.0,1.2)
Time period: 2005-2007	1.1 (1.0,1.2)	1.1 (1.0,1.1)	1.1 (1.0,1.1)
Time period: 2001-2003	1.0 (ref)	1.0 (ref)	1.0 (ref)
Age: 18-34 years	1.3 (1.2,1.5)	1.4 (1.3,1.5)	1.4 (1.3,1.5)
Age: 35-64 years	1.1 (1.0,1.2)	1.0 (0.9,1.0)	1.1 (1.0,1.1)
Age: >=65 years	1.0 (ref)	1.0 (ref)	1.0 (ref)
BMI: Obese	1.2 (1.1,1.4)	1.3 (1.2,1.3)	1.4 (1.3,1.5)
BMI: Overweight	0.8 (0.7,0.9)	0.9 (0.8,0.9)	1.0 (1.0,1.1)
BMI: Not OW/OB	1.0 (ref)	1.0 (ref)	1.0 (ref)
Smoke: Ever	1.5 (1.4,1.7)	1.2 (1.1,1.2)	1.0 (1.0,1.1)
Smoke: Never	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare coverage: Yes	1.2 (1.1,1.3)	0.9 (0.9,1.0)	1 (0.9,1.1)
Healthcare coverage: No	1.0 (ref)	1.0 (ref)	1.0 (ref)
Healthcare provider: Yes	1.9 (1.7,2.2)	1.6 (1.5,1.7)	1.6 (1.5,1.8)
Healthcare provider: No	1.0 (ref)	1.0 (ref)	1.0 (ref)

[a]Adjusted for: Region, time period, age, BMI, smoking, healthcare coverage, healthcare provider, and race.

Dominant Asthma Predictors in the United States, By Sex and SES

The dominant predictors of adult asthma prevalence varied by SES as indicated by education attainment (Tables 4.11 and 4.12). Moreover, the comparative importance of asthma predictors was not congruent with rank according to magnitudes of association with asthma. In particular, race was not an important explanatory factor for asthma prevalence at any level of SES, despite very elevated adjusted asthma prevalence among NHOPI, Whites, and Other race as compared to Asians.

Instead of race, smoking status was the most important predictor of asthma prevalence for females reporting the lowest level of education attainment; ever-smoking contributed about half of the model's predictive ability (52% for lifetime, 47% for current asthma) (Tables 4.11 and 4.12). Moreover, ever-smoking was conditionally dominant over all other covariates, and primary general dominance of smoking was significant. Among those reporting the lowest level of education, possession of a healthcare provider ranked second in importance for females but ranked first for males (accounting for 26% of lifetime and 39% of current asthma variances among males). BMI was also among the most predictive covariates of current asthma for females with lowermost education. But in contrast for females, neither ever-smoking nor BMI were dominant covariates for males of lowest SES. Instead and despite weak associations with asthma, region ranked second in general dominance for both lifetime and current asthma among males who reported lowermost education. Age was the third most important predictor of lifetime asthma among males of lowest SES, despite having the strongest asthma association.

For females reporting the middle and highest levels of education attainment, ever-smoking was not a meaningfully important asthma predictor (Tables 4.11 and 4.12). Instead, BMI was the sole most important and conditionally dominant covariate, significantly explaining more than half of the variance for current asthma (e.g., 52% for high school graduates and 60% for college graduates). Among high school graduate males, age was completely dominant, contributing 61% of the model's predictive ability for lifetime asthma. No covariates were meaningfully dominant for high school graduate males reporting current asthma, or among college graduate males.

Table 4.11. United States, women by education attainment - Dominant predictors of asthma prevalence - Behavioral Risk Factor Surveillance System, 2001-2010.

	Women					
Dominance Rank	**Lifetime asthma Dominant Covariates & Percent of Asthma Explained**					
	< High school		**High school graduate**		**College graduate**	
1st	Smoking[b]	52%	BMI[b]	45%	BMI[b]	53%
2nd	Healthcare provider[b]	15%	None	NA	None	NA
3rd	None	NA	None	NA	None	NA
	Current asthma Dominant Covariates & Percent of Asthma Explained					
	< High school		**High school graduate**		**College graduate**	
1st	Smoking[b]	47%	BMI[b]	52%	BMI[b]	60%
2nd	Healthcare provider[b]	15%	None	NA	None	NA
3rd	BMI	11%	None	NA	None	NA
a: Completely dominant; b: Conditionally dominant						

Table 4.12. United States, men by education attainment - Dominant predictors of asthma prevalence - Behavioral Risk Factor Surveillance System, 2001-2010.

	Men					
Dominance Rank	**Lifetime asthma Dominant Covariates & Percent of Asthma Explained**					
	< High school		**High school graduate**		**College graduate**	
1st	Healthcare provider	26%	Age[a]	61%	None	NA
2nd	Region	22%	None	NA	None	NA
3rd	Age[b]	19%	None	NA	None	NA
	Current asthma Dominant Covariates & Percent of Asthma Explained					
	< High school		**High school graduate**		**College graduate**	
1st	Healthcare provider[b]	39%	None	NA	None	NA
2nd	Region[b]	26%	None	NA	None	NA
3rd	None	NA	None	NA	None	NA
a: Completely dominant; b: Conditionally dominant						

DISCUSSION

This investigation quantified and compared both the strengths of associations and the relative importance of several predictors of asthma prevalence, using multiple logistic regression with a multi-year and nationally representative sample of US adults classified by sex and race, as well as by groupings according to sex and SES as indicated by education attainment. Relative importance was defined and evaluated using a dominance analysis framework, which utilizes pairwise comparisons of the contributions of all model predictors to regression model fit (101-104).

This method for assessing covariate importance encompasses all contexts of a covariate's ability to explain the modelled outcome, by together considering direct, total, and partial effects. As such, the relative importance of a factor predictive of asthma, defined as the amount of asthma variance explained, may be distinct from the covariate's comparative strength of association (which alone can be uninformative of importance, especially in the presence of multicollinearity). Dominance analysis thereby contributes additional information useful for decision-making: Prevention programs may benefit from prioritizing the most influential predictors, particularly when factor importance varies among the populations targeted for having higher asthma burdens (e.g., those of lower SES and/or certain ethnic/racial groups).

For modifiable lifestyle-related asthma risk factors with similar strengths of association within racial subgroups, dominance analyses indicated that ever-smoking was somewhat more important than BMI among NHOPI women, whereas BMI was more important than smoking for women of White, Asian, or Other race. BMI was also a dominant asthma predictor for NHOPI and Asian men, but not among men of White or Other race. Note that the relative prevalence of factors associated with asthma did not necessarily reflect a factor's relative importance in predicting asthma. For example, among Asians, having ever smoked was much more common than obesity, but BMI substantially better explained asthma prevalence than smoking status; indeed, smoking status was not among the dominant predictors of asthma at all among Asians. Moreover, comparative strengths of associations with asthma did not necessarily reflect asthma predictive ability. For example, among Asian women, strengths of association with lifetime asthma were similar for ever-smoking, elevated BMI, and having a healthcare provider, but only BMI was a dominant asthma predictor. Similarly, obesity was both very common and meaningfully associated with asthma among White and Other race men, but BMI was not an important explanatory factor for asthma among these sex/racial groups. Thus, if asthma interventions at the population level must be focused or prioritized, these findings indicate that for women regardless of race, smoking and BMI may be more important than other

factors commonly included in asthma prevention efforts (e.g., aspects of healthcare access). For male NHOPI and Asian populations, weight management programs could be more influential in affecting asthma than smoking cessation efforts.

Compared to the eldest age group (>= 65 years), younger White or Asian men (age 18-34 years) were 80% more likely to report having ever been told they have asthma, whereas middle-aged were 10% more likely. Age explained over half of lifetime asthma prevalence among White men and was both completely and conditionally dominant. Age also best predicted an asthma ever-diagnosis for Asian and Other race men but was not a dominant asthma predictor for women of any race. Thus, asthma prevention programs may wish to prioritize not only lifestyle-related asthma risk factors, but also some age groups, in conjunction with the sociodemographic contexts of sex and race.

Men of Other race were unique in that having a healthcare provider was important in predicting asthma prevalence. These findings suggest that asthma may be underestimated among men of Other race, given the context that this group reported healthcare coverage and provider less frequently, while the outcome of current asthma inherently depends itself on accessing healthcare.

After statistically controlling for potential confounders using multivariable logistic regression, it was found in studies 1 thru 3 that both sex and race continued to modify the magnitudes of many asthma associations, including those between measures of SES and asthma prevalence. Most notably, significant dose-response declines in asthma prevalence with increased levels of SES were consistently observed only among Whites and those of Other race. However, dominance analysis by this study found that NHOPI men were the only race/sex subpopulation in which education made a relatively greater contribution to the prediction of asthma prevalence in comparison to other sociodemographic factors.

Although markedly strong associations between asthma prevalence and race have been frequently observed in the US (8, 12, 13, 18, 26, 28, 29, 53, 54), this investigation found that characteristics other than race better explained heterogeneity in asthma prevalence, regardless of SES level. That is, even when associations with asthma prevalence were substantially stronger for race than for other sociodemographic factors, race was not a dominant predictor of asthma at any level of education attainment.

In addition, the most important predictors of asthma prevalence varied by sex and SES. For example, among the least educated, the factors of ever-smoking, having a healthcare provider, geographic region, BMI, and age better predicted asthma prevalence than did race. Specifically, the most dominant covariate among women with less than a high school education

was smoking status, which also was conditionally dominant and explained nearly half of asthma. Additionally, for women with this lowest education level, BMI remained an important predictor, but only for current asthma, less consistently, and to a lesser degree than having a healthcare provider. These findings contribute additional insight into asthma among socially disadvantaged women, since adjusted prevalence ratios for BMI and healthcare provider were large and nearly identical within this subpopulation.

But dissimilar to women, smoking status was not an important predictor of asthma prevalence among men with lowermost education, despite robust effect sizes for ever-smoking in this group. Instead, healthcare provider and region were the two most important covariates among men who did not graduate from high school: Those with a healthcare provider were nearly twice as likely to report current asthma, with this covariate also explaining nearly 40% of current asthma.

At higher levels of SES as measured by education, BMI best predicted both lifetime and current asthma among women, while age was the only dominant predictor of asthma among high school graduate men. Specifically, the most important covariate predictive of asthma among high school and college graduate women was BMI, which was conditionally dominant and on average explained more than half of current asthma. However, among men who had highest levels of education, smoking status, BMI, aspects of healthcare, and/or region were not dominant explanatory factors for asthma.

For all women and Asian men, asthma prevalence was found in studies 1 and 2 to be highest in Hawai‘i and the western region of the US, but geographic region was a dominant asthma predictor only for women of NHOPI or Asian race, and only for asthma ever-diagnosis. Geographic associations with asthma and their importance were also not uniform across levels of SES as represented by education. For example, asthma prevalence was lowest in the South, especially among women, but only for those in the middle and upper classes. In contrast, among the least educated asthma prevalence was highest in the South, especially for men. Geographic region was also a dominant predictor of asthma among men who reported lowest SES (e.g., explaining 26% of current asthma). Thus, both the degree of impact and the relative importance of regionally-aligned social factors and/or environmental (e.g., climate, air pollution) characteristics on asthma prevalence differs by sex, as well as by both race and SES.

Taken together, these combined results from multiple regression and dominance analyses lend further support for increased recognition that elevated asthma prevalence is closely related to preventable factors of social disadvantage. That is, SES plays a complex key role in the asthma disparities experienced by NHOPI and other minorities. Moreover,

observations that some socially disadvantaged and/or racially-aligned groups within the US more often report lack of healthcare coverage, provider, and/or quality (37-40), indicate that asthma is potentially under-recognized within these subpopulations. As many others have also called for, research and programs for asthma prevention among highly impacted racial/ethnic subpopulations should address this interactive relationship between the socio-political (i.e., non-biological) constructs of race (70, 71) and SES (19, 24, 46, 48). This would further advance needed recognition of the 'social determinants of health' (60-65, 67-69): Associations between SES markers and preventable diseases such as asthma are both as strong and as important as other established disease risk factors having biological basis (e.g., smoking, obesity).

Several of the limitations that apply to this investigation have been presented in studies 1 thru 3, including: Sample size constraints; information bias from the methodology and self-report of the BRFSS survey; the inherent dependence of the asthma outcome measures on healthcare itself; issues surrounding race misclassification that likely bias toward the null; implicit constraints on cross-sectional interpretations especially regarding causation; the existence of multiple asthma phenotypes with similar symptomology yet disparate aetiologies and relationships with SES; unknown bias direction and magnitude from missing data, especially for income.

Additionally, the results and conclusions of this investigation should be considered within the context of other limitations: First, other variables with potentially important roles in asthma prevalence disparities were not included in this study due to lack of availability, recognition, and/or selection for model inclusion based on statistical significance. Because results from dominance analysis depend heavily on *a priori* model choice, it is necessary to keep in mind that covariate relative importance would differ with the inclusion of additional or other factors such as other aspects of healthcare, housing characteristics, outdoor/indoor air quality, etc. Similarly, this investigation could be improved by comparing dominance analysis results from multiple models of asthma prevalence having overlaps in selected covariates. Second, only a single measure at one point in time was used to represent SES, which will insufficiently capture long-term, multi-faceted, and multi-level asthma-impactful exposures over the life course. This is especially relevant for adult asthma outcomes that can have early developmental origins and may also depend on compounding of a variety of exposures over time. Inclusion of various and/or composite SES measures would better capture the multiple pathways by which SES could affect asthma. However, an advantage to the use of education as a proxy for SES, especially in cross-sectional investigations, is that a reversal in causal direction is less likely since education is more static after early adulthood and so is less impacted by disease in later

adulthood. Third, this investigation did not calculate confidence intervals for the computed general dominance metrics, which limited ability to assess the meaningfulness of differences in covariates' predictive contributions to the asthma model. This study could therefore be improved by implementing bootstrap analyses to evaluate the reproducibility of the general dominance results.

Although accompanied by several caveats and limitations, this investigation contributes to the understanding of asthma disparities, and is the first study of national-level differences in asthma prevalence related to race and/or SES that supplements findings from multiple logistic regression with assessments of relative covariate importance using dominance analysis. While dominance analysis is a recommended compliment to multiple regression analyses especially for observational studies with correlated variables (105), and has been adopted by researches in a number of disciplines, its use is as yet under-represented in the epidemiologic literature.

APPENDIX

Table 5.1. United States, by Black/African American or American Indian/Alaska Native race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Black/African American			American Indian/Alaska Native		
	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)
Total	249,917	23,543,337	100.0	51,837	3,847,818	100.0
Sex: Female	170,847	12,907,185	54.8 (54.4,55.2)	30,714	1,722,388	44.8 (43.7,45.8)
Sex: Male	79,070	10,636,152	45.2 (44.8,45.6)	21,123	2,125,430	55.2 (54.2,56.3)
Region: Hawai'i	585	14,346	0.1 (0.1,0.1)	292	4,298	0.1 (0.1,0.1)
Region: West	11,138	2,236,541	9.5 (9.2,9.8)	19,563	1,526,586	39.7 (38.6,40.8)
Region: Midwest	40,507	4,086,849	17.4 (17.1,17.6)	11,111	602,350	15.7 (15.0,16.3)
Region: Northeast	36,395	4,153,426	17.6 (17.3,17.9)	4,784	452,514	11.8 (11.1,12.5)
Region: South	161,292	13,052,176	55.4 (55.1,55.8)	16,087	1,262,070	32.8 (31.9,33.7)
Time period: 2008-2010	104,537	8,397,802	35.7 (35.3,36.0)	21,167	1,373,856	35.7 (34.7,36.7)
Time period: 2005-2007	89,295	7,723,283	32.8 (32.5,33.2)	19,006	1,235,145	32.1 (31.1,33.1)
Time period: 2001-2003	56,085	7,422,252	31.5 (31.2,31.9)	11,664	1,238,818	32.2 (31.2,33.3)
Age: 18-34 years	53,052	8,182,842	35.1 (34.7,35.5)	11,967	1,462,728	38.2 (37.1,39.4)
Age: 35-64 years	143,057	12,162,957	52.1 (51.7,52.5)	30,459	1,943,790	50.8 (49.7,51.9)
Age: >=65 years	50,871	2,997,672	12.8 (12.6,13.1)	9,012	418,220	10.9 (10.4,11.5)
BMI: Obese	87,631	7,151,081	31.8 (31.4,32.1)	16,710	1,059,531	28.8 (27.8,29.7)
BMI: Overweight	75,725	7,080,273	31.4 (31.1,31.8)	16,203	1,159,535	31.5 (30.5,32.5)
BMI: Not OW/OB	73,837	8,286,872	36.8 (36.4,37.2)	17,024	1,463,949	39.7 (38.7,40.8)

Table 5.1. (Continued) United States, by Black/African American or American Indian/Alaska Native race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Black/African American			American Indian/Alaska Native		
	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)	Sample Size	Weighted Population Size	Population characteristics, % (95%CI)
Smoke: Ever	100,914	8,817,195	37.7 (37.3,38.0)	30,213	2,058,732	53.9 (52.8,55.0)
Smoke: Never	147,635	14,600,704	62.3 (62.0,62.7)	21,339	1,761,249	46.1 (45.0,47.2)
Healthcare coverage: Yes	204,985	18,542,103	79.1 (78.8,79.5)	39,200	2,837,951	74.3 (73.3,75.2)
Healthcare coverage: No	44,034	4,885,045	20.9 (20.5,21.2)	12,390	983,516	25.7 (24.8,26.7)
Healthcare provider: Yes	208,108	18,206,916	77.9 (77.5,78.2)	38,593	2,677,921	70.1 (69.0,71.1)
Healthcare provider: No	40,646	5,171,973	22.1 (21.8,22.5)	13,000	1,143,362	29.9 (28.9,31.0)
Healthcare utilization: Yes	175,373	21,297,503	88.9 (88.6,89.2)	31,999	2,992,730	77.3 (76.1,78.4)
Healthcare utilization: No	16,524	2,657,469	11.1 (10.8,11.4)	7,580	879,437	22.7 (21.6,23.9)

Table 5.2. United States, Native Hawaiian/Other Pacific Islander (NHOPI) women or men – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI Women		NHOPI Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Total	7,340	100.0	5,135	100.0
Region: Hawai'i	4,079	15.1 (14.0,16.2)	2,596	10.8 (9.9,11.7)
Region: West	1,426	43.1 (39.8,46.3)	1,121	44.6 (41.1,48.1)
Region: Midwest	414	7.4 (6.3,8.6)	353	11.0 (9.2,13.1)
Region: Northeast	588	14.3 (12.4,16.5)	436	13.2 (11.2,15.6)
Region: South	833	20.2 (18.0,22.6)	629	20.5 (18.0,23.1)
Time period: 2008-2010	2,749	33.1 (30.5,35.7)	1,847	34.2 (31.2,37.4)
Time period: 2005-2007	2,738	34.3 (31.3,37.4)	1,853	35.4 (32.2,38.7)
Time period: 2001-2003	1,853	32.6 (29.6,35.8)	1,435	30.4 (27.3,33.7)
Age: 18-34 years	2,220	46.1 (43.0,49.3)	1,706	52.1 (48.7,55.5)
Age: 35-64 years	4,036	46.8 (43.7,49.8)	2,746	41.9 (38.6,45.2)
Age: >=65 years	1,028	7.1 (5.9,8.6)	658	6.0 (4.8,7.5)
BMI: Obese	2,150	19.6 (17.4,21.9)	1,627	23.2 (20.7,26.0)
BMI: Overweight	1,961	26.0 (23.4,28.7)	1,810	36.1 (32.8,39.5)
BMI: Not OW/OB	2,966	54.5 (51.3,57.6)	1,617	40.7 (37.3,44.1)
Smoke: Ever	3,249	33.3 (30.6,36.1)	2,645	45.0 (41.6,48.4)
Smoke: Never	4,059	66.7 (63.9,69.4)	2,474	55.0 (51.6,58.4)
Healthcare coverage: Yes	6,446	85.5 (83.2,87.5)	4,295	77.8 (74.9,80.5)
Healthcare coverage: No	866	14.5 (12.5,16.8)	804	22.2 (19.5,25.1)
Healthcare provider: Yes	6,311	82.6 (80.0,85.0)	3,870	69.5 (66.4,72.5)
Healthcare provider: No	998	17.4 (15.0,20.0)	1,240	30.5 (27.5,33.6)
Healthcare utilization: Yes	4,526	85.7 (83.2,87.9)	2,822	79.3 (76.3,82.0)
Healthcare utilization: No	898	14.3 (12.1,16.8)	839	20.7 (18.0,23.7)

Table 5.3. United States, Asian women or men – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Asian Women		Asian Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Total	33,223	100.0	24,174	100.0
Region: Hawai'i	12,855	7.3 (7.0,7.5)	8,504	5.6 (5.4,5.8)
Region: West	7,010	41.5 (40.2,42.7)	4,737	36.1 (34.8,37.4)
Region: Midwest	2,742	11.5 (10.9,12.2)	2,230	12.6 (11.9,13.4)
Region: Northeast	5,524	19.8 (19.0,20.7)	4,898	23.2 (22.2,24.2)
Region: South	5,092	19.9 (19.0,20.8)	3,805	22.5 (21.4,23.7)
Time period: 2008-2010	13,424	37.9 (36.8,39.0)	9,563	39.0 (37.7,40.2)
Time period: 2005-2007	11,576	32.2 (31.0,33.3)	8,071	31.9 (30.7,33.1)
Time period: 2001-2003	8,223	30.0 (28.8,31.2)	6,540	29.2 (28.0,30.4)
Age: 18-34 years	8,197	38.7 (37.5,40.0)	6,328	40.7 (39.4,42.1)
Age: 35-64 years	18,338	51.3 (50.1,52.5)	13,739	51.6 (50.3,52.9)
Age: >=65 years	6,177	9.9 (9.2,10.7)	3,830	7.7 (7.1,8.3)
BMI: Obese	2,617	6.4 (5.9,6.9)	2,403	7.8 (7.1,8.5)
BMI: Overweight	6,845	19.6 (18.6,20.6)	8,514	33.4 (32.2,34.6)
BMI: Not OW/OB	22,379	74.0 (73.0,75.1)	12,660	58.9 (57.6,60.1)
Smoke: Ever	6,669	13.4 (12.7,14.1)	9,652	34.4 (33.2,35.6)
Smoke: Never	26,406	86.6 (85.9,87.3)	14,360	65.6 (64.4,66.8)
Healthcare coverage: Yes	30,563	88.4 (87.5,89.2)	21,772	86.9 (85.9,87.8)
Healthcare coverage: No	2,560	11.6 (10.8,12.5)	2,322	13.1 (12.2,14.1)
Healthcare provider: Yes	28,848	80.6 (79.5,81.7)	19,304	73.8 (72.6,75.0)
Healthcare provider: No	4,217	19.4 (18.3,20.5)	4,726	26.2 (25.0,27.4)
Healthcare utilization: Yes	21,412	86.8 (85.9,87.7)	13,935	79.2 (77.8,80.5)
Healthcare utilization: No	3,270	13.2 (12.3,14.1)	3,476	20.8 (19.5,22.2)

Table 5.4. United States, White women or men – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White Women		White Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Total	1,586,418	100.0	998,946	100.0
Region: Hawai'i	12,957	0.2 (0.2,0.2)	9,979	0.2 (0.2,0.2)
Region: West	363,451	22.6 (22.5,22.7)	240,638	23.2 (23.0,23.3)
Region: Midwest	365,912	24.3 (24.2,24.4)	236,104	24.5 (24.3,24.6)
Region: Northeast	330,013	19.1 (19.0,19.2)	207,151	18.4 (18.3,18.6)
Region: South	514,085	33.8 (33.7,33.9)	305,074	33.7 (33.6,33.9)
Time period: 2008-2010	662,233	34.5 (34.4,34.6)	407,932	34.5 (34.4,34.7)
Time period: 2005-2007	576,466	33.2 (33.0,33.3)	356,941	33.2 (33.0,33.4)
Time period: 2001-2003	347,719	32.4 (32.2,32.5)	234,073	32.2 (32.1,32.4)
Age: 18-34 years	221,157	26.5 (26.3,26.6)	148,495	29.4 (29.2,29.6)
Age: 35-64 years	865,395	52.4 (52.3,52.6)	579,056	54.4 (54.2,54.6)
Age: >=65 years	485,910	21.1 (21.0,21.2)	266,819	16.3 (16.1,16.4)
BMI: Obese	334,279	20.4 (20.3,20.5)	240,552	23.0 (22.9,23.2)
BMI: Overweight	424,393	26.0 (25.9,26.2)	414,508	39.6 (39.4,39.8)
BMI: Not OW/OB	736,527	53.6 (53.5,53.8)	332,583	37.4 (37.2,37.6)
Smoke: Ever	698,860	42.0 (41.9,42.2)	554,562	51.9 (51.7,52.1)
Smoke: Never	880,791	58.0 (57.8,58.1)	440,288	48.1 (47.9,48.3)
Healthcare coverage: Yes	1,436,795	88.2 (88.1,88.3)	889,069	85.8 (85.6,85.9)
Healthcare coverage: No	146,697	11.8 (11.7,11.9)	107,035	14.2 (14.1,14.4)
Healthcare provider: Yes	1,422,568	86.8 (86.7,87.0)	818,747	77.4 (77.2,77.6)
Healthcare provider: No	159,517	13.2 (13.0,13.3)	176,380	22.6 (22.4,22.8)
Healthcare utilization: Yes	1,059,122	85.3 (85.2,85.4)	603,191	76.7 (76.5,76.9)
Healthcare utilization: No	163,698	14.7 (14.6,14.8)	153,384	23.3 (23.1,23.5)

Table 5.5. United States, Other race women or men – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Other Race Women		Other Race Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Total	273,184	100.0	150,084	100.0
Region: Hawai'i	1,767	0.1 (0.1,0.1)	1,366	0.2 (0.2,0.2)
Region: West	36,833	14.5 (14.2,14.8)	26,905	17.0 (16.6,17.5)
Region: Midwest	43,334	15.6 (15.3,15.8)	24,105	14.9 (14.6,15.2)
Region: Northeast	45,329	18.9 (18.6,19.2)	25,077	17.9 (17.5,18.3)
Region: South	145,921	50.9 (50.5,51.2)	72,631	50.0 (49.5,50.5)
Time period: 2008-2010	112,028	34.0 (33.7,34.3)	59,432	34.7 (34.2,35.1)
Time period: 2005-2007	101,789	34.6 (34.3,34.9)	54,562	35.0 (34.5,35.5)
Time period: 2001-2003	59,367	31.4 (31.1,31.7)	36,090	30.3 (29.9,30.8)
Age: 18-34 years	64,636	36.9 (36.5,37.2)	35,514	40.6 (40.1,41.2)
Age: 35-64 years	150,760	50.1 (49.7,50.5)	85,573	49.8 (49.3,50.4)
Age: >=65 years	52,660	13.1 (12.8,13.3)	26,944	9.5 (9.3,9.8)
BMI: Obese	90,609	31.4 (31.1,31.8)	41,369	26.6 (26.1,27.0)
BMI: Overweight	73,836	28.1 (27.8,28.5)	55,353	36.4 (35.9,36.9)
BMI: Not OW/OB	85,931	40.5 (40.1,40.9)	47,742	37.0 (36.5,37.5)
Smoke: Ever	99,562	31.5 (31.1,31.8)	79,045	46.7 (46.2,47.2)
Smoke: Never	172,081	68.5 (68.2,68.9)	69,938	53.3 (52.8,53.8)
Healthcare coverage: Yes	217,307	76.9 (76.6,77.3)	114,250	70.8 (70.3,71.3)
Healthcare coverage: No	54,912	23.1 (22.7,23.4)	34,900	29.2 (28.7,29.7)
Healthcare provider: Yes	225,363	79.2 (78.8,79.5)	106,575	64.3 (63.8,64.8)
Healthcare provider: No	46,586	20.8 (20.5,21.2)	42,566	35.7 (35.2,36.2)
Healthcare utilization: Yes	189,931	88.8 (88.5,89.1)	91,891	79.0 (78.5,79.5)
Healthcare utilization: No	21,178	11.2 (10.9,11.5)	20,435	21.0 (20.5,21.5)

Table 5.6. Hawai'i, by Black/African American or American Indian/Alaska Native race – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	Black/African American		American Indian/ Alaska Native	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Total	585	100.0	292	100.0
Sex: Female	285	39.3 (34.7,44.1)	168	47.5 (39.7,55.3)
Sex: Male	300	60.7 (55.9,65.3)	124	52.5 (44.7,60.3)
Time period: 2008-2010	184	30.4 (26.0,35.1)	83	25.6 (19.5,32.8)
Time period: 2005-2007	190	32.0 (27.4,36.9)	118	38.0 (30.8,45.7)
Time period: 2001-2003	211	37.7 (32.9,42.6)	91	36.4 (28.9,44.7)
Age: 18-34 years	212	48.4 (43.3,53.5)	59	30.0 (23.0,38.2)
Age: 35-64 years	334	48.7 (43.6,53.7)	182	57.1 (49.1,64.7)
Age: >=65 years	35	3.0 (2.0,4.4)	50	12.9 (9.2,17.7)
BMI: Obese	133	25.0 (20.6,30.0)	55	25.3 (18.3,33.8)
BMI: Overweight	185	32.1 (27.7,36.9)	75	28.2 (21.6,36.0)
BMI: Not OW/OB	259	42.9 (38.0,48.0)	157	46.5 (38.7,54.4)
Smoke: Ever	237	35.9 (31.3,40.8)	173	53.3 (45.4,61.0)
Smoke: Never	347	64.1 (59.2,68.7)	119	46.7 (39.0,54.6)
Healthcare coverage: Yes	548	95.3 (93.0,96.9)	245	83.4 (76.9,88.3)
Healthcare coverage: No	37	4.7 (3.1,7.0)	47	16.6 (11.7,23.1)
Healthcare provider: Yes	474	79.2 (74.5,83.2)	232	77.6 (70.4,83.5)
Healthcare provider: No	110	20.8 (16.8,25.5)	60	22.4 (16.5,29.6)
Healthcare utilization: Yes	324	88.7 (84.0,92.2)	151	80.0 (72.4,85.9)
Healthcare utilization: No	48	11.3 (7.8,16.0)	49	20.0 (14.1,27.6)

Table 5.7. Hawai'i, Native Hawaiian/Other Pacific Islander (NHOPI) women or men – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	NHOPI Women		NHOPI Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Time period: 2008-2010	1,516	38.3 (36.2,40.4)	941	37.8 (35.2,40.6)
Time period: 2005-2007	1,540	34.7 (32.8,36.7)	930	31.9 (29.5,34.4)
Time period: 2001-2003	1,023	27.0 (25.2,28.9)	725	30.2 (27.8,32.8)
Age: 18-34 years	1,113	39.7 (37.4,42.0)	724	45.1 (42.2,47.9)
Age: 35-64 years	2,253	47.6 (45.4,49.8)	1459	45.1 (42.4,47.8)
Age: >=65 years	697	12.8 (11.5,14.1)	404	9.9 (8.6,11.3)
BMI: Obese	1,441	38.2 (36.0,40.4)	1033	42.1 (39.4,44.9)
BMI: Overweight	1,119	26.4 (24.5,28.4)	841	30.1 (27.7,32.6)
BMI: Not OW/OB	1,437	35.4 (33.4,37.5)	696	27.8 (25.4,30.3)
Smoke: Ever	2,007	46.3 (44.2,48.5)	1387	50.3 (47.5,53.0)
Smoke: Never	2,058	53.7 (51.5,55.8)	1205	49.7 (47.0,52.5)
Healthcare coverage: Yes	3,775	91.0 (89.4,92.4)	2315	87.2 (85.0,89.1)
Healthcare coverage: No	299	9.0 (7.6,10.6)	270	12.8 (10.9,15.0)
Healthcare provider: Yes	3,662	88.0 (86.4,89.5)	2097	76.2 (73.6,78.7)
Healthcare provider: No	409	12.0 (10.5,13.6)	491	23.8 (21.3,26.4)
Healthcare utilization: Yes	2,457	80.9 (78.6,83.0)	1415	74.3 (71.1,77.2)
Healthcare utilization: No	564	19.1 (17.0,21.4)	444	25.7 (22.8,28.9)

Table 5.8. Hawai'i, Asian women or men – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	Asian Women		Asian Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Time period: 2008-2010	4,706	34.4 (33.4,35.4)	3,151	35.0 (33.7,36.3)
Time period: 2005-2007	4,592	33.4 (32.4,34.3)	2,964	33.3 (32.1,34.6)
Time period: 2001-2003	3,557	32.2 (31.3,33.2)	2,389	31.7 (30.4,33.0)
Age: 18-34 years	1,873	24.1 (22.9,25.2)	1,405	30.0 (28.5,31.5)
Age: 35-64 years	6,736	50.7 (49.6,51.9)	4,751	50.9 (49.5,52.4)
Age: >=65 years	4,138	25.2 (24.3,26.1)	2,302	19.1 (18.1,20.1)
BMI: Obese	1,249	10.1 (9.4,10.9)	1,227	14.5 (13.5,15.6)
BMI: Overweight	2,960	22.5 (21.5,23.4)	3,318	39.2 (37.8,40.6)
BMI: Not OW/OB	8,276	67.4 (66.3,68.5)	3,897	46.3 (44.9,47.7)
Smoke: Ever	3,604	26.3 (25.3,27.3)	4,296	47.1 (45.6,48.5)
Smoke: Never	9,220	73.7 (72.7,74.7)	4,183	52.9 (51.5,54.4)
Healthcare coverage: Yes	12,387	95.8 (95.2,96.3)	8,014	92.8 (92.0,93.7)
Healthcare coverage: No	446	4.2 (3.7,4.8)	476	7.2 (6.3,8.0)
Healthcare provider: Yes	11,981	92.5 (91.8,93.1)	7,434	85.5 (84.3,86.5)
Healthcare provider: No	851	7.5 (6.9,8.2)	1,047	14.5 (13.5,15.7)
Healthcare utilization: Yes	7,829	84.4 (83.4,85.5)	4,787	76.4 (74.8,78.0)
Healthcare utilization: No	1,348	15.6 (14.5,16.6)	1,252	23.6 (22.0,25.2)

Table 5.9. Hawai'i, White women or men – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	White Women		White Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Time period: 2008-2010	4,819	33.4 (32.5,34.4)	3,559	33.4 (32.2,34.6)
Time period: 2005-2007	4,705	33.4 (32.4,34.4)	3,634	33.2 (32.1,34.4)
Time period: 2001-2003	3,433	33.2 (32.1,34.2)	2,786	33.4 (32.2,34.6)
Age: 18-34 years	1,917	26.3 (25.2,27.5)	1,459	28.5 (27.1,29.9)
Age: 35-64 years	7,929	54.6 (53.5,55.8)	6,195	55.6 (54.2,56.9)
Age: >=65 years	3,049	19.0 (18.2,19.9)	2,286	16.0 (15.2,16.8)
BMI: Obese	2,037	16.3 (15.4,17.2)	1,772	18.3 (17.2,19.3)
BMI: Overweight	2,992	23.2 (22.3,24.3)	3,828	38.8 (37.5,40.1)
BMI: Not OW/OB	7,652	60.5 (59.3,61.6)	4,293	43.0 (41.6,44.3)
Smoke: Ever	6,348	45.8 (44.7,47.0)	5,482	51.5 (50.1,52.8)
Smoke: Never	6,573	54.2 (53.0,55.3)	4,463	48.5 (47.2,49.9)
Healthcare coverage: Yes	11,972	93.0 (92.3,93.5)	9,043	91.3 (90.5,92.1)
Healthcare coverage: No	979	7.0 (6.5,7.7)	924	8.7 (7.9,9.5)
Healthcare provider: Yes	11,158	84.9 (84.0,85.7)	7,902	76.2 (75.0,77.4)
Healthcare provider: No	1,790	15.1 (14.3,16.0)	2,058	23.8 (22.6,25.0)
Healthcare utilization: Yes	7,636	82.1 (81.1,83.1)	5,434	76.5 (75.1,77.9)
Healthcare utilization: No	1,785	17.9 (16.9,18.9)	1,703	23.5 (22.1,24.9)

Table 5.10. Hawai'i, Other race women or men – Sample sizes and sociodemographic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

Hawai'i	Other Race Women		Other Race Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Time period: 2008-2010	544	29.8 (27.0,32.6)	445	28.4 (25.5,31.6)
Time period: 2005-2007	700	35.4 (32.6,38.2)	518	37.2 (33.9,40.6)
Time period: 2001-2003	523	34.9 (32.0,37.9)	403	34.4 (31.1,37.8)
Age: 18-34 years	455	38.4 (35.3,41.7)	342	42.7 (39.1,46.5)
Age: 35-64 years	1,006	51.1 (48.0,54.3)	802	49.5 (45.9,53.1)
Age: >=65 years	261	10.4 (8.9,12.1)	187	7.8 (6.4,9.4)
BMI: Obese	318	18.5 (16.2,21.1)	312	27.0 (23.8,30.5)
BMI: Overweight	407	24.0 (21.5,26.8)	504	37.2 (33.8,40.7)
BMI: Not OW/OB	944	57.4 (54.3,60.5)	519	35.8 (32.5,39.2)
Smoke: Ever	693	33.1 (30.4,36.0)	730	48.7 (45.2,52.2)
Smoke: Never	1,063	66.9 (64.0,69.6)	630	51.3 (47.8,54.8)
Healthcare coverage: Yes	1,614	92.2 (90.2,93.9)	1,195	88.1 (85.6,90.2)
Healthcare coverage: No	152	7.8 (6.1,9.8)	163	11.9 (9.8,14.4)
Healthcare provider: Yes	1,490	84.4 (81.9,86.6)	1,051	75.1 (71.8,78.2)
Healthcare provider: No	270	15.6 (13.4,18.1)	307	24.9 (21.8,28.2)
Healthcare utilization: Yes	1,023	84.6 (81.7,87.2)	713	76.7 (72.8,80.1)
Healthcare utilization: No	205	15.4 (12.8,18.3)	235	23.3 (19.9,27.2)

Table 5.11. United States, by Black/African American or American Indian/Alaska Native race – Sample sizes and socioeconomic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Black/African American		American Indian/ Alaska Native	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Education: <High school	42,873	15.1 (14.9,15.4)	10,385	23.0 (22.1,24.0)
Education: High school	150,630	62.2 (61.8,62.6)	32,115	60.6 (59.6,61.7)
Education: College	55,431	22.6 (22.3,23.0)	9,167	16.3 (15.6,17.1)
Household income: Missing	34,413	13.7 (13.5,14.0)	6,157	12.4 (11.7,13.2)
Household income: <$15K	47,475	15.5 (15.2,15.7)	10,832	17.3 (16.5,18.1)
Household income: <$25K	54,868	20.3 (20.0,20.6)	12,077	21.3 (20.5,22.2)
Household income: <$35K	32,895	13.1 (12.8,13.3)	6,605	12.9 (12.2,13.6)
Household income: <$50K	31,082	13.2 (13.0,13.5)	6,445	13.6 (12.8,14.4)
Household income: <$75K	24,310	11.1 (10.9,11.3)	4,994	10.7 (10.1,11.4)
Household income: ≥$75K	24,874	13.1 (12.8,13.4)	4,727	11.8 (11.1,12.5)
Individual income: Missing	34,612	13.8 (13.6,14.1)	6,190	12.5 (11.7,13.2)
Individual income: <$5K	32,118	16.8 (16.5,17.1)	8,924	21.6 (20.7,22.6)
Individual income: <$10K	48,343	19.5 (19.2,19.8)	11,336	21.6 (20.8,22.6)
Individual income: <$15K	34,713	14.5 (14.2,14.7)	7,579	14.7 (13.9,15.5)
Individual income: <$20K	29,070	12.3 (12.1,12.6)	5,704	10.7 (10.1,11.3)
Individual income: <$35K	44,362	15.5 (15.2,15.7)	8,205	13.2 (12.6,13.8)
Individual income: ≥$35K	26,699	7.7 (7.5,7.8)	3,899	5.7 (5.3,6.1)
PIR: Missing	34,613	13.8 (13.6,14.1)	6,194	12.5 (11.8,13.3)
PIR: <1	49,098	20.2 (19.9,20.5)	12,407	24.5 (23.5,25.5)
PIR: <2	62,025	24.1 (23.7,24.4)	13,744	25.6 (24.6,26.5)
PIR: <3	40,579	15.9 (15.6,16.2)	8,152	15.8 (15.0,16.6)
PIR: >=3	63,602	26.0 (25.7,26.4)	11,340	21.7 (20.9,22.5)
Composite SES: Missing	34,894	14.0 (13.7,14.2)	6,252	12.7 (12.0,13.5)
Composite SES: Low	26,902	9.6 (9.3,9.8)	6,866	15.5 (14.7,16.3)
Composite SES: Mid	147,191	59.9 (59.5,60.3)	32,612	61.0 (59.9,62.0)
Composite SES: High	40,930	16.6 (16.3,16.8)	6,107	10.9 (10.3,11.4)
Employment: Unemployed	51,990	19.4 (19.1,19.7)	11,592	20.0 (19.1,20.8)
Employment: Other	66,494	22.4 (22.0,22.7)	13,419	23.5 (22.6,24.4)
Employment: Employed	130,151	58.2 (57.8,58.6)	26,594	56.6 (55.5,57.7)
Healthcare cost barrier: Yes	37,067	20.1 (19.8,20.5)	8,378	23.2 (22.1,24.3)
Healthcare cost barrier: No	156,057	79.9 (79.5,80.2)	31,634	76.8 (75.7,77.9)

Table 5.12. United States, Native Hawaiian/Other Pacific Islander (NHOPI) women or men – Sample sizes and socioeconomic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	NHOPI Women		NHOPI Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Education: <High school	651	10.8 (8.6,13.5)	475	11.1 (9.1,13.6)
Education: High school	4,899	60.3 (57.2,63.3)	3,403	59.4 (56.0,62.7)
Education: College	1,770	28.9 (26.3,31.7)	1,241	29.5 (26.5,32.6)
Household income: Missing	945	12.7 (11.0,14.6)	672	13.1 (10.8,15.9)
Household income: <$15K	912	10.5 (8.7,12.7)	468	9.2 (7.3,11.5)
Household income: <$25K	1,298	15.8 (13.6,18.2)	804	14.8 (12.7,17.2)
Household income: <$35K	903	12.1 (10.2,14.3)	608	11.8 (9.8,14.2)
Household income: <$50K	1,088	13.4 (11.5,15.6)	816	14.4 (12.1,17.0)
Household income: <$75K	991	13.5 (11.7,15.4)	762	14.0 (11.9,16.4)
Household income: ≥$75K	1,203	22.1 (19.4,24.9)	1,005	22.7 (20.1,25.5)
Individual income: Missing	949	12.7 (11.0,14.6)	679	13.3 (10.9,16.1)
Individual income: <$5K	1,022	17.7 (15.2,20.6)	517	15.7 (13.2,18.6)
Individual income: <$10K	1,371	17.1 (14.8,19.8)	851	19.3 (16.7,22.3)
Individual income: <$15K	1,159	16.0 (13.8,18.4)	802	13.4 (11.4,15.8)
Individual income: <$20K	1,035	16.8 (14.7,19.2)	756	15.1 (12.9,17.6)
Individual income: <$35K	1,198	13.7 (11.9,15.6)	929	15.1 (12.9,17.4)
Individual income: ≥$35K	606	6.1 (5.1,7.2)	601	8.0 (6.7,9.6)
PIR: Missing	950	12.7 (11.0,14.6)	681	13.7 (11.2,16.5)
PIR: <1	1,365	18.8 (16.2,21.6)	703	16.5 (14.1,19.3)
PIR: <2	1,813	20.1 (17.9,22.5)	1,192	22.2 (19.5,25.2)
PIR: <3	1,403	19.3 (16.8,22.1)	994	15.3 (13.2,17.6)
PIR: >=3	1,809	29.1 (26.5,31.9)	1,565	32.3 (29.3,35.5)
Composite SES: Missing	952	12.7 (11.1,14.7)	686	13.9 (11.5,16.7)
Composite SES: Low	417	7.3 (5.4,9.7)	294	7.6 (5.9,9.8)
Composite SES: Mid	4,701	58.6 (55.6,61.6)	3,238	58.3 (54.9,61.6)
Composite SES: High	1,270	21.3 (19.0,23.8)	917	20.2 (17.8,22.9)
Employment: Unemployed	858	14.4 (12.1,17.1)	699	15.2 (12.9,17.9)
Employment: Other	2,168	27.4 (24.8,30.2)	961	15.9 (13.7,18.3)
Employment: Employed	4,283	58.1 (55.0,61.2)	3,450	68.9 (65.7,71.9)
Healthcare cost barrier: Yes	818	18.2 (15.6,21.2)	466	16.0 (13.4,19.0)
Healthcare cost barrier: No	4,654	81.8 (78.8,84.4)	3,225	84.0 (81.0,86.6)

Table 5.13. United States, Asian women or men – Sample sizes and socioeconomic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Asian Women		Asian Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Education: <High school	1,877	5.5 (4.9,6.1)	1,020	4.5 (3.9,5.1)
Education: High school	13,784	35.9 (34.7,37.1)	9,021	31.9 (30.6,33.1)
Education: College	17,357	58.6 (57.4,59.8)	14,019	63.7 (62.4,65.0)
Household income: Missing	5,704	15.5 (14.6,16.4)	2,877	10.9 (10.1,11.7)
Household income: <$15K	2,499	8.9 (8.1,9.7)	1,350	7.0 (6.3,7.8)
Household income: <$25K	3,641	9.9 (9.2,10.7)	2,384	9.5 (8.8,10.4)
Household income: <$35K	3,077	7.7 (7.1,8.4)	2,206	7.8 (7.2,8.5)
Household income: <$50K	4,267	11.9 (11.1,12.7)	3,197	11.7 (10.8,12.6)
Household income: <$75K	4,693	13.6 (12.8,14.4)	3,935	15.2 (14.3,16.2)
Household income: ≥$75K	9,342	32.5 (31.4,33.6)	8,225	37.8 (36.6,39.1)
Individual income: Missing	5,728	15.6 (14.7,16.5)	2,905	11.0 (10.3,11.8)
Individual income: <$5K	2,054	10.5 (9.6,11.5)	1,315	9.6 (8.8,10.6)
Individual income: <$10K	3,665	12.4 (11.5,13.3)	2,499	12.2 (11.3,13.1)
Individual income: <$15K	4,108	13.4 (12.5,14.2)	2,855	12.8 (11.9,13.8)
Individual income: <$20K	5,763	19.8 (18.9,20.8)	4,568	22.6 (21.5,23.7)
Individual income: <$35K	7,115	18.3 (17.5,19.2)	5,626	19.8 (18.8,20.8)
Individual income: ≥$35K	4,790	10.0 (9.5,10.6)	4,406	12.0 (11.4,12.7)
PIR: Missing	5,729	15.6 (14.7,16.5)	2,905	11.0 (10.3,11.8)
PIR: <1	3,044	12.1 (11.2,13.0)	1,842	10.8 (9.9,11.8)
PIR: <2	5,429	14.7 (13.8,15.6)	3,629	14.3 (13.4,15.3)
PIR: <3	5,643	16.0 (15.2,17.0)	4,084	15.7 (14.7,16.7)
PIR: >=3	13,378	41.6 (40.5,42.8)	11,714	48.2 (46.9,49.5)
Composite SES: Missing	5,780	15.7 (14.8,16.6)	2,931	11.1 (10.4,11.9)
Composite SES: Low	1,051	3.5 (3.1,4.0)	568	2.6 (2.2,3.1)
Composite SES: Mid	13,795	39.5 (38.3,40.8)	9,664	38.0 (36.7,39.3)
Composite SES: High	12,597	41.2 (40.1,42.4)	11,011	48.3 (47.0,49.6)
Employment: Unemployed	2,187	8.6 (7.8,9.4)	1,595	7.8 (7.1,8.5)
Employment: Other	11,869	33.6 (32.4,34.8)	5,204	18.8 (17.7,19.9)
Employment: Employed	18,987	57.8 (56.6,59.0)	17,249	73.4 (72.2,74.6)
Healthcare cost barrier: Yes	2,185	11.7 (10.8,12.6)	1,443	10.8 (9.8,12.0)
Healthcare cost barrier: No	22,705	88.3 (87.4,89.2)	16,137	89.2 (88.0,90.2)

Table 5.14. United States, White women or men – Sample sizes and socioeconomic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	White Women		White Men	
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Education: <High school	136,570	10.0 (9.9,10.1)	83,877	10.1 (10.0,10.3)
Education: High school	942,650	58.1 (57.9,58.2)	539,016	54.2 (54.0,54.3)
Education: College	503,473	31.9 (31.8,32.1)	373,775	35.7 (35.6,35.9)
Household income: Missing	249,378	15.1 (15.0,15.3)	99,918	10.3 (10.2,10.4)
Household income: <$15K	158,329	9.0 (8.9,9.1)	64,045	6.3 (6.2,6.4)
Household income: <$25K	246,309	13.7 (13.6,13.8)	125,920	11.9 (11.7,12.0)
Household income: <$35K	177,533	10.4 (10.3,10.5)	112,453	10.5 (10.3,10.6)
Household income: <$50K	221,265	13.6 (13.5,13.7)	157,005	14.5 (14.4,14.7)
Household income: <$75K	224,604	14.9 (14.8,15.0)	169,446	16.8 (16.6,16.9)
Household income: ≥$75K	309,000	23.2 (23.0,23.3)	270,159	29.8 (29.6,30.0)
Individual income: Missing	250,371	15.2 (15.1,15.3)	100,606	10.4 (10.3,10.5)
Individual income: <$5K	69,467	8.1 (7.9,8.2)	31,829	7.0 (6.8,7.1)
Individual income: <$10K	175,255	12.4 (12.3,12.5)	94,472	11.5 (11.4,11.6)
Individual income: <$15K	205,357	13.6 (13.5,13.7)	123,070	13.6 (13.5,13.8)
Individual income: <$20K	245,641	17.3 (17.2,17.5)	165,684	19.0 (18.9,19.2)
Individual income: <$35K	391,849	21.7 (21.6,21.8)	272,022	23.5 (23.4,23.7)
Individual income: ≥$35K	248,478	11.7 (11.6,11.8)	211,263	15.0 (14.9,15.1)
PIR: Missing	250,375	15.2 (15.1,15.3)	100,607	10.4 (10.3,10.5)
PIR: <1	127,297	10.1 (10.0,10.2)	56,239	8.3 (8.1,8.4)
PIR: <2	286,520	17.5 (17.3,17.6)	151,617	15.8 (15.7,16.0)
PIR: <3	293,995	17.0 (16.9,17.2)	185,595	17.4 (17.2,17.5)
PIR: >=3	628,231	40.2 (40.0,40.3)	504,888	48.2 (48.0,48.4)
Composite SES: Missing	251,299	15.3 (15.2,15.4)	101,305	10.5 (10.3,10.6)
Composite SES: Low	76,545	6.0 (5.9,6.1)	43,533	6.0 (5.8,6.1)
Composite SES: Mid	862,094	53.5 (53.3,53.6)	541,285	53.8 (53.6,54.0)
Composite SES: High	396,480	25.2 (25.1,25.4)	312,823	29.8 (29.6,29.9)
Employment: Unemployed	151,464	9.4 (9.3,9.5)	91,923	9.6 (9.5,9.7)
Employment: Other	646,911	37.9 (37.7,38.0)	286,481	21.6 (21.4,21.7)
Employment: Employed	783,133	52.7 (52.6,52.9)	617,674	68.8 (68.7,69.0)
Healthcare cost barrier: Yes	142,509	13.9 (13.8,14.1)	64,139	10.5 (10.3,10.6)
Healthcare cost barrier: No	1,093,894	86.1 (85.9,86.2)	699,214	89.5 (89.4,89.7)

Table 5.15. United States, Other race women or men – Sample sizes and socioeconomic weighted population characteristics - Behavioral Risk Factor Surveillance System, 2001-2010.

United States	Other Women	Other Women	Other Men	Other Men
	Sample Size	Population characteristics, % (95%CI)	Sample Size	Population characteristics, % (95%CI)
Education: <High school	54,295	19.1 (18.8,19.4)	31,381	21.2 (20.8,21.6)
Education: High school	158,320	59.0 (58.6,59.4)	84,571	58.3 (57.8,58.8)
Education: College	58,947	21.9 (21.6,22.2)	33,098	20.5 (20.1,20.9)
Household income: Missing	44,693	16.1 (15.8,16.4)	20,971	14.1 (13.8,14.5)
Household income: <$15K	55,378	17.6 (17.3,17.9)	21,531	12.6 (12.3,13.0)
Household income: <$25K	61,879	21.4 (21.1,21.7)	31,985	21.3 (20.9,21.7)
Household income: <$35K	33,797	12.5 (12.3,12.8)	19,761	13.0 (12.6,13.3)
Household income: <$50K	30,904	12.1 (11.9,12.4)	19,870	13.2 (12.9,13.6)
Household income: <$75K	23,490	9.6 (9.4,9.9)	16,356	11.2 (10.9,11.5)
Household income: ≥$75K	23,043	10.6 (10.3,10.8)	19,610	14.5 (14.2,14.9)
Individual income: Missing	44,968	16.2 (15.9,16.5)	21,184	14.3 (13.9,14.6)
Individual income: <$5K	43,225	20.5 (20.1,20.8)	17,494	17.8 (17.3,18.2)
Individual income: <$10K	55,432	20.3 (20.0,20.6)	27,428	19.7 (19.3,20.1)
Individual income: <$15K	36,392	13.6 (13.3,13.8)	20,795	14.2 (13.8,14.5)
Individual income: <$20K	28,509	10.4 (10.2,10.7)	18,437	12.5 (12.2,12.8)
Individual income: <$35K	41,806	13.1 (12.9,13.3)	27,290	14.3 (14.0,14.6)
Individual income: ≥$35K	22,852	5.9 (5.8,6.1)	17,456	7.3 (7.1,7.5)
PIR: Missing	44,970	16.2 (15.9,16.5)	21,189	14.3 (13.9,14.6)
PIR: <1	61,376	23.8 (23.4,24.1)	24,996	20.1 (19.6,20.5)
PIR: <2	68,424	24.4 (24.1,24.8)	35,851	24.1 (23.7,24.5)
PIR: <3	40,259	14.2 (14.0,14.5)	24,820	15.4 (15.1,15.8)
PIR: >=3	58,155	21.4 (21.1,21.7)	43,228	26.1 (25.7,26.6)
Composite SES: Missing	45,334	16.4 (16.1,16.6)	21,499	14.5 (14.1,14.9)
Composite SES: Low	34,812	12.4 (12.2,12.7)	20,234	14.2 (13.9,14.6)
Composite SES: Mid	152,803	56.3 (56.0,56.7)	84,482	56.6 (56.1,57.1)
Composite SES: High	40,235	14.9 (14.6,15.1)	23,869	14.6 (14.3,15.0)
Employment: Unemployed	53,964	17.7 (17.4,18.0)	27,498	17.4 (17.0,17.8)
Employment: Other	81,273	29.1 (28.8,29.5)	32,690	16.4 (16.0,16.7)
Employment: Employed	136,060	53.1 (52.8,53.5)	88,800	66.2 (65.7,66.7)
Healthcare cost barrier: Yes	46,385	23.7 (23.4,24.1)	19,451	19.8 (19.3,20.3)
Healthcare cost barrier: No	166,660	76.3 (75.9,76.6)	93,924	80.2 (79.7,80.7)

Table 5.16. General dominance analysis methodology, after Table 2 in Azen & Traxel (2009).

Where R is the analogue model R^2 for logistic regression defined by McFadden (1974) that is based on the likelihood ratio (104, 106).											
k	**s**	**Base submodel ID#**	**Base submodel**	**Var1 i=1: Region**	**Var2 i=2: Time period**	**Var3 i=3: Age**	**Var4 i=4: BMI**	**Var5 i=5: Smoking**	**Var6 i=6: Health-care coverage**	**Var7 i=7: Health-care provider**	**Var8 i=8: Race or SES**
0		#0	Univariate	*R#1*	*R#2*	*R#3*	*R#4*	*R#5*	*R#6*	*R#7*	R#8
				i=1, k=0 average = M10	*i=2 k=0 average = M20*	*i=3 k=0 average = M30*	*i=4 k=0 average = M40*	*i=5 k=0 average = M50*	*i=6 k=0 average = M60*	*i=7 k=0 average = M70*	*i=8 k=0 average = M80*
1		#1	Var1	*R#1-R#1*	*R#9-R#1*	*R#10-R#1*	*R#11-R#1*	*R#12-R#1*	*R#13-R#1*	*R#14-R#1*	R#15-R#1
1		#2	Var2	*R#9-R#2*	*R#2-R#2*	*R#16-R#2*	*R#17-R#2*	*R#18-R#2*	*R#19-R#2*	*R#20-R#2*	R#21-R#2
1		#3	Var3	*R#10-R#3*	*R#16-R#3*	*R#3-R#3*	*R#22-R#3*	*R#23-R#3*	*R#24-R#3*	*R#25-R#3*	R#26-R#3
1		#4	Var4	*R#11-R#4*	*R#17-R#4*	*R#22-R#4*	*R#4-R#4*	*R#27-R#4*	*R#28-R#4*	*R#29-R#4*	R#30-R#4
1		#5	Var5	*R#12-R#5*	*R#18-R#5*	*R#23-R#5*	*R#27-R#5*	*R#5-R#5*	*R#31-R#5*	*R#32-R#5*	R#33-R#5
1		#6	Var6	*R#13-R#6*	*R#19-R#6*	*R#24-R#6*	*R#28-R#6*	*R#31-R#6*	*R#6-R#6*	*R#34-R#6*	R#35-R#6
1		#7	Var7	*R#14-R#7*	*R#20-R#7*	*R#25-R#7*	*R#29-R#7*	*R#32-R#7*	*R#34-R#7*	*R#7-R#7*	R#36-R#7
1		#8	Var8	*R#15-R#8*	*R#21-R#8*	*R#26-R#8*	*R#30-R#8*	*R#33-R#8*	*R#35-R#8*	*R#36-R#8*	R#8-R#8
1	*8*			*i=1 k=1 average = M11*	*i=2 k=1 average = M21*	*i=3 k=1 average = M31*	*i=4 k=1 average = M41*	*i=5 k=1 average = M51*	*i=6 k=1 average = M61*	*i=7 k=1 average = M71*	*i=8 k=1 average = M81*

Table 5.16. (Continued) General dominance analysis methodology, after Table 2 in Azen & Traxel (2009).

k	s	Base submodel ID#	Base submodel	Var1 i=1: Region	Var2 i=2: Time period	Var3 i=3: Age	Var4 i=4: BMI	Var5 i=5: Smoking	Var6 i=6: Health-care coverage	Var7 i=7: Health-care provider	Var8 i=8: Race or SES
2		#9	Var1,Var2	*R#9-R#9*	*R#9-R#9*	*R#37-R#9*	*R#38-R#9*	*R#39-R#9*	*R#40-R#9*	*R#41-R#9*	R#42-R#9
2		#10	Var1,Var3	*R#10-R#10*	*R#37-R#10*	*R#10-R#10*	*R#43-R#10*	*R#44-R#10*	*R#45-R#10*	*R#46-R#10*	R#47-R#10
2		#11	Var1,Var4	*R#11-R#11*	*R#38-R#11*	*R#43-R#11*	*R#11-R#11*	*R#48-R#11*	*R#49-R#11*	*R#50-R#11*	R#51-R#11
2		#12	Var1,Var5	*R#12-R#12*	*R#39-R#12*	*R#44-R#12*	*R#48-R#12*	*R#12-R#12*	*R#52-R#12*	*R#53-R#12*	R#54-R#12
2		#13	Var1,Var6	*R#13-R#13*	*R#40-R#13*	*R#45-R#13*	*R#49-R#13*	*R#52-R#13*	*R#13-R#13*	*R#55-R#13*	R#56-R#13
2		#14	Var1,Var7	*R#14-R#14*	*R#41-R#14*	*R#46-R#14*	*R#50-R#14*	*R#53-R#14*	*R#55-R#14*	*R#14-R#14*	R#57-R#14
2		#15	Var1,Var8	*R#15-R#15*	*R#42-R#15*	*R#47-R#15*	*R#51-R#15*	*R#54-R#15*	*R#56-R#15*	*R#57-R#15*	R#15-R#15
2		#16	Var2,Var3	*R#37-R#16*	*R#16-R#16*	*R#16-R#16*	*R#58-R#16*	*R#59-R#16*	*R#60-R#16*	*R#61-R#16*	R#62-R#16
2		#17	Var2,Var4	*R#38-R#17*	*R#17-R#17*	*R#58-R#17*	*R#17-R#17*	*R#63-R#17*	*R#64-R#17*	*R#65-R#17*	R#66-R#17
2		#18	Var2,Var5	*R#39-R#18*	*R#18-R#18*	*R#59-R#18*	*R#63-R#18*	*R#18-R#18*	*R#67-R#18*	*R#68-R#18*	R#69-R#18
2		#19	Var2,Var6	*R#40-R#19*	*R#19-R#19*	*R#60-R#19*	*R#64-R#19*	*R#67-R#19*	*R#19-R#19*	*R#70-R#19*	R#71-R#19
2		#20	Var2,Var7	*R#41-R#20*	*R#20-R#20*	*R#61-R#20*	*R#65-R#20*	*R#68-R#20*	*R#70-R#20*	*R#20-R#20*	R#72-R#20
2		#21	Var2,Var8	*R#42-R#21*	*R#21-R#21*	*R#62-R#21*	*R#66-R#21*	*R#69-R#21*	*R#71-R#21*	*R#72-R#21*	R#21-R#21

Table 5.16. (Continued) General dominance analysis methodology, after Table 2 in Azen & Traxel (2009).

k	s	Base submodel ID#	Base submodel	Var1 i=1: Region	Var2 i=2: Time period	Var3 i=3: Age	Var4 i=4: BMI	Var5 i=5: Smoking	Var6 i=6: Health-care coverage	Var7 i=7: Health-care provider	Var8 i=8: Race or SES
2		#22	Var3,Var4	*R#43-R#22*	*R#58-R#22*	*R#22-R#22*	*R#22-R#22*	*R#73-R#22*	*R#74-R#22*	*R#75-R#22*	R#76-R#22
2		#23	Var3,Var5	*R#44-R#23*	*R#59-R#23*	*R#23-R#23*	*R#73-R#23*	*R#23-R#23*	*R#77-R#23*	*R#78-R#23*	R#79-R#23
2		#24	Var3,Var6	*R#45-R#24*	*R#60-R#24*	*R#24-R#24*	*R#74-R#24*	*R#77-R#24*	*R#24-R#24*	*R#80-R#24*	R#81-R#24
2		#25	Var3,Var7	*R#46-R#25*	*R#61-R#25*	*R#25-R#25*	*R#75-R#25*	*R#78-R#25*	*R#80-R#25*	*R#25-R#25*	R#82-R#25
2		#26	Var3,Var8	*R#47-R#26*	*R#62-R#26*	*R#26-R#26*	*R#76-R#26*	*R#79-R#26*	*R#81-R#26*	*R#82-R#26*	R#26-R#26
2		#27	Var4,Var5	*R#48-R#27*	*R#63-R#27*	*R#73-R#27*	*R#27-R#27*	*R#27-R#27*	*R#83-R#27*	*R#84-R#27*	R#85-R#27
2		#28	Var4,Var6	*R#49-R#28*	*R#64-R#28*	*R#74-R#28*	*R#28-R#28*	*R#83-R#28*	*R#28-R#28*	*R#86-R#28*	R#87-R#28
2		#29	Var4,Var7	*R#50-R#29*	*R#65-R#29*	*R#75-R#29*	*R#29-R#29*	*R#84-R#29*	*R#86-R#29*	*R#29-R#29*	R#88-R#29
2		#30	Var4,Var8	*R#51-R#30*	*R#66-R#30*	*R#76-R#30*	*R#30-R#30*	*R#85-R#30*	*R#87-R#30*	*R#88-R#30*	R#30-R#30
2		#31	Var5,Var6	*R#52-R#31*	*R#67-R#31*	*R#77-R#31*	*R#83-R#31*	*R#31-R#31*	*R#31-R#31*	*R#89-R#31*	R#90-R#31
2		#32	Var5,Var7	*R#53-R#32*	*R#68-R#32*	*R#78-R#32*	*R#84-R#32*	*R#32-R#32*	*R#89-R#32*	*R#32-R#32*	R#91-R#32
2		#33	Var5,Var8	*R#54-R#33*	*R#69-R#33*	*R#79-R#33*	*R#85-R#33*	*R#33-R#33*	*R#90-R#33*	*R#91-R#33*	R#33-R#33
2		#34	Var6,Var7	*R#55-R#34*	*R#70-R#34*	*R#80-R#34*	*R#86-R#34*	*R#89-R#34*	*R#34-R#34*	*R#34-R#34*	R#92-R#34

Table 5.16. (Continued) General dominance analysis methodology, after Table 2 in Azen & Traxel (2009).

2		#35	Var6,Var8	*R#56-R#35*	*R#71-R#35*	*R#81-R#35*	*R#87-R#35*	*R#90-R#35*	*R#35-R#35*	*R#92-R#35*	R#35-R#35
2		#36	Var7,Var8	*R#57-R#36*	*R#72-R#36*	*R#82-R#36*	*R#88-R#36*	*R#91-R#36*	*R#92-R#36*	*R#36-R#36*	R#36-R#36
2	*28*			*i=1 k=2 average = M12*	*i=2 k=2 average = M22*	*i=3 k=2 average = M32*	*i=4 k=2 average = M42*	*i=5 k=2 average = M52*	*i=6 k=2 average = M62*	*i=7 k=2 average = M72*	*i=8 k=2 average = M82*
3		#37	Var1,Var2, Var3	*R#37-R#37*	*R#37-R#37*	*R#37-R#37*	*R#93-R#37*	*R#94-R#37*	*R#95-R#37*	*R#96-R#37*	R#97-R#37
3		#38	Var1,Var2, Var4	*R#38-R#38*	*R#38-R#38*	*R#93-R#38*	*R#38-R#38*	*R#98-R#38*	*R#99-R#38*	*R#100-R#38*	R#101-R#38
3		#39	Var1,Var2, Var5	*R#39-R#39*	*R#39-R#39*	*R#94-R#39*	*R#98-R#39*	*R#39-R#39*	*R#102-R#39*	*R#103-R#39*	R#104-R#39
3		#40	Var1,Var2, Var6	*R#40-R#40*	*R#40-R#40*	*R#95-R#40*	*R#99-R#40*	*R#102-R#40*	*R#40-R#40*	*R#105-R#40*	R#106-R#40
3		#41	Var1,Var2, Var7	*R#41-R#41*	*R#41-R#41*	*R#96-R#41*	*R#100-R#41*	*R#103-R#41*	*R#105-R#41*	*R#41-R#41*	R#107-R#41
3		#42	Var1,Var2, Var8	*R#42-R#42*	*R#42-R#42*	*R#97-R#42*	*R#101-R#42*	*R#104-R#42*	*R#106-R#42*	*R#107-R#42*	R#42-R#42
3		#43	Var1,Var3, Var4	*R#43-R#43*	*R#93-R#43*	*R#43-R#43*	*R#43-R#43*	*R#108-R#43*	*R#109-R#43*	*R#110-R#43*	R#111-R#43
3		#44	Var1,Var3, Var5	*R#44-R#44*	*R#94-R#44*	*R#44-R#44*	*R#108-R#44*	*R#44-R#44*	*R#112-R#44*	*R#113-R#44*	R#114-R#44
3		#45	Var1,Var3, Var6	*R#45-R#45*	*R#95-R#45*	*R#45-R#45*	*R#109-R#45*	*R#112-R#45*	*R#45-R#45*	*R#115-R#45*	R#116-R#45
3		#46	Var1,Var3, Var7	*R#46-R#46*	*R#96-R#46*	*R#46-R#46*	*R#110-R#46*	*R#113-R#46*	*R#115-R#46*	*R#46-R#46*	R#117-R#46
3		#47	Var1,Var3, Var8	*R#47-R#47*	*R#97-R#47*	*R#47-R#47*	*R#111-R#47*	*R#114-R#47*	*R#116-R#47*	*R#117-R#47*	R#47-R#47
3		#48	Var1,Var4, Var5	*R#48-R#48*	*R#98-R#48*	*R#108-R#48*	*R#48-R#48*	*R#48-R#48*	*R#118-R#48*	*R#119-R#48*	R#120-R#48

3		#49	Var1,Var4, Var6	*R#49*- *R#49*	*R#99*- *R#49*	*R#109*- *R#49*	*R#49*- *R#49*	*R#118*- *R#49*	*R#49*- *R#49*	*R#121*- *R#49*	R#122- R#49
3		#50	Var1,Var4, Var7	*R#50*- *R#50*	*R#100*- *R#50*	*R#110*- *R#50*	*R#50*- *R#50*	*R#119*- *R#50*	*R#121*- *R#50*	*R#50*- *R#50*	R#123- R#50
3		#51	Var1,Var4, Var8	*R#51*- *R#51*	*R#101*- *R#51*	*R#111*- *R#51*	*R#51*- *R#51*	*R#120*- *R#51*	*R#122*- *R#51*	*R#123*- *R#51*	R#51- R#51
3		#52	Var1,Var5, Var6	*R#52*- *R#52*	*R#102*- *R#52*	*R#112*- *R#52*	*R#118*- *R#52*	*R#52*- *R#52*	*R#52*- *R#52*	*R#124*- *R#52*	R#125- R#52
3		#53	Var1,Var5, Var7	*R#53*- *R#53*	*R#103*- *R#53*	*R#113*- *R#53*	*R#119*- *R#53*	*R#53*- *R#53*	*R#124*- *R#53*	*R#53*- *R#53*	R#126- R#53
3		#54	Var1,Var5, Var8	*R#54*- *R#54*	*R#104*- *R#54*	*R#114*- *R#54*	*R#120*- *R#54*	*R#54*- *R#54*	*R#125*- *R#54*	*R#126*- *R#54*	R#54- R#54
3		#55	Var1,Var6, Var7	*R#55*- *R#55*	*R#105*- *R#55*	*R#115*- *R#55*	*R#121*- *R#55*	*R#124*- *R#55*	*R#55*- *R#55*	*R#55*- *R#55*	R#127- R#55
3		#56	Var1,Var6, Var8	*R#56*- *R#56*	*R#106*- *R#56*	*R#116*- *R#56*	*R#122*- *R#56*	*R#125*- *R#56*	*R#56*- *R#56*	*R#127*- *R#56*	R#56- R#56
3		#57	Var1,Var7, Var8	*R#57*- *R#57*	*R#107*- *R#57*	*R#117*- *R#57*	*R#123*- *R#57*	*R#126*- *R#57*	*R#127*- *R#57*	*R#57*- *R#57*	R#57- R#57
3		#58	Var2,Var3, Var4	*R#93*- *R#58*	*R#58*- *R#58*	*R#58*- *R#58*	*R#58*- *R#58*	*R#128*- *R#58*	*R#129*- *R#58*	*R#130*- *R#58*	R#131- R#58
3		#59	Var2,Var3, Var5	*R#94*- *R#59*	*R#59*- *R#59*	*R#59*- *R#59*	*R#128*- *R#59*	*R#59*- *R#59*	*R#132*- *R#59*	*R#133*- *R#59*	R#134- R#59
3		#60	Var2,Var3, Var6	*R#95*- *R#60*	*R#60*- *R#60*	*R#60*- *R#60*	*R#129*- *R#60*	*R#132*- *R#60*	*R#60*- *R#60*	*R#135*- *R#60*	R#136- R#60
3		#61	Var2,Var3, Var7	*R#96*- *R#61*	*R#61*- *R#61*	*R#61*- *R#61*	*R#130*- *R#61*	*R#133*- *R#61*	*R#135*- *R#61*	*R#61*- *R#61*	R#137- R#61
3		#62	Var2,Var3, Var8	*R#97*- *R#62*	*R#62*- *R#62*	*R#62*- *R#62*	*R#131*- *R#62*	*R#134*- *R#62*	*R#136*- *R#62*	*R#137*- *R#62*	R#62- R#62
3		#63	Var2,Var4, Var5	*R#98*- *R#63*	*R#63*- *R#63*	*R#128*- *R#63*	*R#63*- *R#63*	*R#63*- *R#63*	*R#138*- *R#63*	*R#139*- *R#63*	R#140- R#63
3		#64	Var2,Var4, Var6	*R#99*- *R#64*	*R#64*- *R#64*	*R#129*- *R#64*	*R#64*- *R#64*	*R#138*- *R#64*	*R#64*- *R#64*	*R#141*- *R#64*	R#142- R#64

3		#65	Var2,Var4, Var7	*R#100-R#65*	*R#65-R#65*	*R#130-R#65*	*R#65-R#65*	*R#139-R#65*	*R#141-R#65*	*R#65-R#65*	R#143-R#65
3		#66	Var2,Var4, Var8	*R#101-R#66*	*R#66-R#66*	*R#131-R#66*	*R#66-R#66*	*R#140-R#66*	*R#142-R#66*	*R#143-R#66*	R#66-R#66
3		#67	Var2,Var5, Var6	*R#102-R#67*	*R#67-R#67*	*R#132-R#67*	*R#138-R#67*	*R#67-R#67*	*R#67-R#67*	*R#144-R#67*	R#145-R#67
3		#68	Var2,Var5, Var7	*R#103-R#68*	*R#68-R#68*	*R#133-R#68*	*R#139-R#68*	*R#68-R#68*	*R#144-R#68*	*R#68-R#68*	R#146-R#68
3		#69	Var2,Var5, Var8	*R#104-R#69*	*R#69-R#69*	*R#134-R#69*	*R#140-R#69*	*R#69-R#69*	*R#145-R#69*	*R#146-R#69*	R#69-R#69
3		#70	Var2,Var6, Var7	*R#105-R#70*	*R#70-R#70*	*R#135-R#70*	*R#141-R#70*	*R#144-R#70*	*R#70-R#70*	*R#70-R#70*	R#147-R#70
3		#71	Var2,Var6, Var8	*R#106-R#71*	*R#71-R#71*	*R#136-R#71*	*R#142-R#71*	*R#145-R#71*	*R#71-R#71*	*R#147-R#71*	R#71-R#71
3		#72	Var2,Var7, Var8	*R#107-R#72*	*R#72-R#72*	*R#137-R#72*	*R#143-R#72*	*R#146-R#72*	*R#147-R#72*	*R#72-R#72*	R#72-R#72
3		#73	Var3,Var4, Var5	*R#108-R#73*	*R#128-R#73*	*R#73-R#73*	*R#73-R#73*	*R#73-R#73*	*R#148-R#73*	*R#149-R#73*	R#150-R#73
3		#74	Var3,Var4, Var6	*R#109-R#74*	*R#129-R#74*	*R#74-R#74*	*R#74-R#74*	*R#148-R#74*	*R#74-R#74*	*R#151-R#74*	R#152-R#74
3		#75	Var3,Var4, Var7	*R#110-R#75*	*R#130-R#75*	*R#75-R#75*	*R#75-R#75*	*R#149-R#75*	*R#151-R#75*	*R#75-R#75*	R#153-R#75
3		#76	Var3,Var4, Var8	*R#111-R#76*	*R#131-R#76*	*R#76-R#76*	*R#76-R#76*	*R#150-R#76*	*R#152-R#76*	*R#153-R#76*	R#76-R#76
3		#77	Var3,Var5, Var6	*R#112-R#77*	*R#132-R#77*	*R#77-R#77*	*R#148-R#77*	*R#77-R#77*	*R#77-R#77*	*R#154-R#77*	R#155-R#77
3		#78	Var3,Var5, Var7	*R#113-R#78*	*R#133-R#78*	*R#78-R#78*	*R#149-R#78*	*R#78-R#78*	*R#154-R#78*	*R#78-R#78*	R#156-R#78
3		#79	Var3,Var5, Var8	*R#114-R#79*	*R#134-R#79*	*R#79-R#79*	*R#150-R#79*	*R#79-R#79*	*R#155-R#79*	*R#156-R#79*	R#79-R#79
3		#80	Var3,Var6, Var7	*R#115-R#80*	*R#135-R#80*	*R#80-R#80*	*R#151-R#80*	*R#154-R#80*	*R#80-R#80*	*R#80-R#80*	R#157-R#80

3		#81	Var3,Var6, Var8	*R#116-R#81*	*R#136-R#81*	*R#81-R#81*	*R#152-R#81*	*R#155-R#81*	*R#81-R#81*	*R#157-R#81*	R#81-R#81
3		#82	Var3,Var7, Var8	*R#117-R#82*	*R#137-R#82*	*R#82-R#82*	*R#153-R#82*	*R#156-R#82*	*R#157-R#82*	*R#82-R#82*	R#82-R#82
3		#83	Var4,Var5, Var6	*R#118-R#83*	*R#138-R#83*	*R#148-R#83*	*R#83-R#83*	*R#83-R#83*	*R#83-R#83*	*R#158-R#83*	R#159-R#83
3		#84	Var4,Var5, Var7	*R#119-R#84*	*R#139-R#84*	*R#149-R#84*	*R#84-R#84*	*R#84-R#84*	*R#158-R#84*	*R#84-R#84*	R#160-R#84
3		#85	Var4,Var5, Var8	*R#120-R#85*	*R#140-R#85*	*R#150-R#85*	*R#85-R#85*	*R#85-R#85*	*R#159-R#85*	*R#160-R#85*	R#85-R#85
3		#86	Var4,Var6, Var7	*R#121-R#86*	*R#141-R#86*	*R#151-R#86*	*R#86-R#86*	*R#158-R#86*	*R#86-R#86*	*R#86-R#86*	R#161-R#86
3		#87	Var4,Var6, Var8	*R#122-R#87*	*R#142-R#87*	*R#152-R#87*	*R#87-R#87*	*R#159-R#87*	*R#87-R#87*	*R#161-R#87*	R#87-R#87
3		#88	Var4,Var7, Var8	*R#123-R#88*	*R#143-R#88*	*R#153-R#88*	*R#88-R#88*	*R#160-R#88*	*R#161-R#88*	*R#88-R#88*	R#88-R#88
3		#89	Var5,Var6, Var7	*R#124-R#89*	*R#144-R#89*	*R#154-R#89*	*R#158-R#89*	*R#89-R#89*	*R#89-R#89*	*R#89-R#89*	R#162-R#89
3		#90	Var5,Var6, Var8	*R#125-R#90*	*R#145-R#90*	*R#155-R#90*	*R#159-R#90*	*R#90-R#90*	*R#90-R#90*	*R#162-R#90*	R#90-R#90
3		#91	Var5,Var7, Var8	*R#126-R#91*	*R#146-R#91*	*R#156-R#91*	*R#160-R#91*	*R#91-R#91*	*R#162-R#91*	*R#91-R#91*	R#91-R#91
3		#92	Var6,Var7, Var8	*R#127-R#92*	*R#147-R#92*	*R#157-R#92*	*R#161-R#92*	*R#162-R#92*	*R#92-R#92*	*R#92-R#92*	R#92-R#92
3	*56*			*i=1 k=3 average = M13*	*i=2 k=3 average = M23*	*i=3 k=3 average = M33*	*i=4 k=3 average = M43*	*i=5 k=3 average = M53*	*i=6 k=3 average = M63*	*i=7 k=3 average = M73*	*i=8 k=3 average = M83*
4		#93	Var1,Var2, Var3,Var4	*R#93-R#93*	*R#93-R#93*	*R#93-R#93*	*R#93-R#93*	*R#163-R#93*	*R#164-R#93*	*R#165-R#93*	R#166-R#93
4		#94	Var1,Var2, Var3,Var5	*R#94-R#94*	*R#94-R#94*	*R#94-R#94*	*R#163-R#94*	*R#94-R#94*	*R#167-R#94*	*R#168-R#94*	R#169-R#94
4		#95	Var1,Var2, Var3,Var6	*R#95-R#95*	*R#95-R#95*	*R#95-R#95*	*R#164-R#95*	*R#167-R#95*	*R#95-R#95*	*R#170-R#95*	R#171-R#95

4		#96	Var1,Var2, Var3,Var7	*R#96-* *R#96*	*R#96-* *R#96*	*R#96-* *R#96*	*R#165-* *R#96*	*R#168-* *R#96*	*R#170-* *R#96*	*R#96-* *R#96*	R#172- R#96
4		#97	Var1,Var2, Var3,Var8	*R#97-* *R#97*	*R#97-* *R#97*	*R#97-* *R#97*	*R#166-* *R#97*	*R#169-* *R#97*	*R#171-* *R#97*	*R#172-* *R#97*	R#97- R#97
4		#98	Var1,Var2, Var4,Var5	*R#98-* *R#98*	*R#98-* *R#98*	*R#163-* *R#98*	*R#98-* *R#98*	*R#98-* *R#98*	*R#173-* *R#98*	*R#174-* *R#98*	R#175- R#98
4		#99	Var1,Var2, Var4,Var6	*R#99-* *R#99*	*R#99-* *R#99*	*R#164-* *R#99*	*R#99-* *R#99*	*R#173-* *R#99*	*R#99-* *R#99*	*R#176-* *R#99*	R#177- R#99
4		#100	Var1,Var2, Var4,Var7	*R#100-* *R#100*	*R#100-* *R#100*	*R#165-* *R#100*	*R#100-* *R#100*	*R#174-* *R#100*	*R#176-* *R#100*	*R#100-* *R#100*	R#178- R#100
4		#101	Var1,Var2, Var4,Var8	*R#101-* *R#101*	*R#101-* *R#101*	*R#166-* *R#101*	*R#101-* *R#101*	*R#175-* *R#101*	*R#177-* *R#101*	*R#178-* *R#101*	R#101- R#101
4		#102	Var1,Var2, Var5,Var6	*R#102-* *R#102*	*R#102-* *R#102*	*R#167-* *R#102*	*R#173-* *R#102*	*R#102-* *R#102*	*R#102-* *R#102*	*R#179-* *R#102*	R#180- R#102
4		#103	Var1,Var2, Var5,Var7	*R#103-* *R#103*	*R#103-* *R#103*	*R#168-* *R#103*	*R#174-* *R#103*	*R#103-* *R#103*	*R#179-* *R#103*	*R#103-* *R#103*	R#181- R#103
4		#104	Var1,Var2, Var5,Var8	*R#104-* *R#104*	*R#104-* *R#104*	*R#169-* *R#104*	*R#175-* *R#104*	*R#104-* *R#104*	*R#180-* *R#104*	*R#181-* *R#104*	R#104- R#104
4		#105	Var1,Var2, Var6,Var7	*R#105-* *R#105*	*R#105-* *R#105*	*R#170-* *R#105*	*R#176-* *R#105*	*R#179-* *R#105*	*R#105-* *R#105*	*R#105-* *R#105*	R#182- R#105
4		#106	Var1,Var2, Var6,Var8	*R#106-* *R#106*	*R#106-* *R#106*	*R#171-* *R#106*	*R#177-* *R#106*	*R#180-* *R#106*	*R#106-* *R#106*	*R#182-* *R#106*	R#106- R#106
4		#107	Var1,Var2, Var7,Var8	*R#107-* *R#107*	*R#107-* *R#107*	*R#172-* *R#107*	*R#178-* *R#107*	*R#181-* *R#107*	*R#182-* *R#107*	*R#107-* *R#107*	R#107- R#107
4		#108	Var1,Var3, Var4,Var5	*R#108-* *R#108*	*R#163-* *R#108*	*R#108-* *R#108*	*R#108-* *R#108*	*R#108-* *R#108*	*R#183-* *R#108*	*R#184-* *R#108*	R#185- R#108
4		#109	Var1,Var3, Var4,Var6	*R#109-* *R#109*	*R#164-* *R#109*	*R#109-* *R#109*	*R#109-* *R#109*	*R#183-* *R#109*	*R#109-* *R#109*	*R#186-* *R#109*	R#187- R#109
4		#110	Var1,Var3, Var4,Var7	*R#110-* *R#110*	*R#165-* *R#110*	*R#110-* *R#110*	*R#110-* *R#110*	*R#184-* *R#110*	*R#186-* *R#110*	*R#110-* *R#110*	R#188- R#110
4		#111	Var1,Var3, Var4,Var8	*R#111-* *R#111*	*R#166-* *R#111*	*R#111-* *R#111*	*R#111-* *R#111*	*R#185-* *R#111*	*R#187-* *R#111*	*R#188-* *R#111*	R#111- R#111

4		#112	Var1,Var3, Var5,Var6	*R#112*- *R#112*	*R#167*- *R#112*	*R#112*- *R#112*	*R#183*- *R#112*	*R#112*- *R#112*	*R#112*- *R#112*	*R#189*- *R#112*	R#190- R#112
4		#113	Var1,Var3, Var5,Var7	*R#113*- *R#113*	*R#168*- *R#113*	*R#113*- *R#113*	*R#184*- *R#113*	*R#113*- *R#113*	*R#189*- *R#113*	*R#113*- *R#113*	R#191- R#113
4		#114	Var1,Var3, Var5,Var8	*R#114*- *R#114*	*R#169*- *R#114*	*R#114*- *R#114*	*R#185*- *R#114*	*R#114*- *R#114*	*R#190*- *R#114*	*R#191*- *R#114*	R#114- R#114
4		#115	Var1,Var3, Var6,Var7	*R#115*- *R#115*	*R#170*- *R#115*	*R#115*- *R#115*	*R#186*- *R#115*	*R#189*- *R#115*	*R#115*- *R#115*	*R#115*- *R#115*	R#192- R#115
4		#116	Var1,Var3, Var6,Var8	*R#116*- *R#116*	*R#171*- *R#116*	*R#116*- *R#116*	*R#187*- *R#116*	*R#190*- *R#116*	*R#116*- *R#116*	*R#192*- *R#116*	R#116- R#116
4		#117	Var1,Var3, Var7,Var8	*R#117*- *R#117*	*R#172*- *R#117*	*R#117*- *R#117*	*R#188*- *R#117*	*R#191*- *R#117*	*R#192*- *R#117*	*R#117*- *R#117*	R#117- R#117
4		#118	Var1,Var4, Var5,Var6	*R#118*- *R#118*	*R#173*- *R#118*	*R#183*- *R#118*	*R#118*- *R#118*	*R#118*- *R#118*	*R#118*- *R#118*	*R#193*- *R#118*	R#194- R#118
4		#119	Var1,Var4, Var5,Var7	*R#119*- *R#119*	*R#174*- *R#119*	*R#184*- *R#119*	*R#119*- *R#119*	*R#119*- *R#119*	*R#193*- *R#119*	*R#119*- *R#119*	R#195- R#119
4		#120	Var1,Var4, Var5,Var8	*R#120*- *R#120*	*R#175*- *R#120*	*R#185*- *R#120*	*R#120*- *R#120*	*R#120*- *R#120*	*R#194*- *R#120*	*R#195*- *R#120*	R#120- R#120
4		#121	Var1,Var4, Var6,Var7	*R#121*- *R#121*	*R#176*- *R#121*	*R#186*- *R#121*	*R#121*- *R#121*	*R#193*- *R#121*	*R#121*- *R#121*	*R#121*- *R#121*	R#196- R#121
4		#122	Var1,Var4, Var6,Var8	*R#122*- *R#122*	*R#177*- *R#122*	*R#187*- *R#122*	*R#122*- *R#122*	*R#194*- *R#122*	*R#122*- *R#122*	*R#196*- *R#122*	R#122- R#122
4		#123	Var1,Var4, Var7,Var8	*R#123*- *R#123*	*R#178*- *R#123*	*R#188*- *R#123*	*R#123*- *R#123*	*R#195*- *R#123*	*R#196*- *R#123*	*R#123*- *R#123*	R#123- R#123
4		#124	Var1,Var5, Var6,Var7	*R#124*- *R#124*	*R#179*- *R#124*	*R#189*- *R#124*	*R#193*- *R#124*	*R#124*- *R#124*	*R#124*- *R#124*	*R#124*- *R#124*	R#197- R#124
4		#125	Var1,Var5, Var6,Var8	*R#125*- *R#125*	*R#180*- *R#125*	*R#190*- *R#125*	*R#194*- *R#125*	*R#125*- *R#125*	*R#125*- *R#125*	*R#197*- *R#125*	R#125- R#125
4		#126	Var1,Var5, Var7,Var8	*R#126*- *R#126*	*R#181*- *R#126*	*R#191*- *R#126*	*R#195*- *R#126*	*R#126*- *R#126*	*R#197*- *R#126*	*R#126*- *R#126*	R#126- R#126
4		#127	Var1,Var6, Var7,Var8	*R#127*- *R#127*	*R#182*- *R#127*	*R#192*- *R#127*	*R#196*- *R#127*	*R#197*- *R#127*	*R#127*- *R#127*	*R#127*- *R#127*	R#127- R#127

4		#128	Var2,Var3, Var4,Var5	*R#163-* *R#128*	*R#128-* *R#128*	*R#128-* *R#128*	*R#128-* *R#128*	*R#128-* *R#128*	*R#198-* *R#128*	*R#199-* *R#128*	R#200- R#128
4		#129	Var2,Var3, Var4,Var6	*R#164-* *R#129*	*R#129-* *R#129*	*R#129-* *R#129*	*R#129-* *R#129*	*R#198-* *R#129*	*R#129-* *R#129*	*R#201-* *R#129*	R#202- R#129
4		#130	Var2,Var3, Var4,Var7	*R#165-* *R#130*	*R#130-* *R#130*	*R#130-* *R#130*	*R#130-* *R#130*	*R#199-* *R#130*	*R#201-* *R#130*	*R#130-* *R#130*	R#203- R#130
4		#131	Var2,Var3, Var4,Var8	*R#166-* *R#131*	*R#131-* *R#131*	*R#131-* *R#131*	*R#131-* *R#131*	*R#200-* *R#131*	*R#202-* *R#131*	*R#203-* *R#131*	R#131- R#131
4		#132	Var2,Var3, Var5,Var6	*R#167-* *R#132*	*R#132-* *R#132*	*R#132-* *R#132*	*R#198-* *R#132*	*R#132-* *R#132*	*R#132-* *R#132*	*R#204-* *R#132*	R#205- R#132
4		#133	Var2,Var3, Var5,Var7	*R#168-* *R#133*	*R#133-* *R#133*	*R#133-* *R#133*	*R#199-* *R#133*	*R#133-* *R#133*	*R#204-* *R#133*	*R#133-* *R#133*	R#206- R#133
4		#134	Var2,Var3, Var5,Var8	*R#169-* *R#134*	*R#134-* *R#134*	*R#134-* *R#134*	*R#200-* *R#134*	*R#134-* *R#134*	*R#205-* *R#134*	*R#206-* *R#134*	R#134- R#134
4		#135	Var2,Var3, Var6,Var7	*R#170-* *R#135*	*R#135-* *R#135*	*R#135-* *R#135*	*R#201-* *R#135*	*R#204-* *R#135*	*R#135-* *R#135*	*R#135-* *R#135*	R#207- R#135
4		#136	Var2,Var3, Var6,Var8	*R#171-* *R#136*	*R#136-* *R#136*	*R#136-* *R#136*	*R#202-* *R#136*	*R#205-* *R#136*	*R#136-* *R#136*	*R#207-* *R#136*	R#136- R#136
4		#137	Var2,Var3, Var7,Var8	*R#172-* *R#137*	*R#137-* *R#137*	*R#137-* *R#137*	*R#203-* *R#137*	*R#206-* *R#137*	*R#207-* *R#137*	*R#137-* *R#137*	R#137- R#137
4		#138	Var2,Var4, Var5,Var6	*R#173-* *R#138*	*R#138-* *R#138*	*R#198-* *R#138*	*R#138-* *R#138*	*R#138-* *R#138*	*R#138-* *R#138*	*R#208-* *R#138*	R#209- R#138
4		#139	Var2,Var4, Var5,Var7	*R#174-* *R#139*	*R#139-* *R#139*	*R#199-* *R#139*	*R#139-* *R#139*	*R#139-* *R#139*	*R#208-* *R#139*	*R#139-* *R#139*	R#210- R#139
4		#140	Var2,Var4, Var5,Var8	*R#175-* *R#140*	*R#140-* *R#140*	*R#200-* *R#140*	*R#140-* *R#140*	*R#140-* *R#140*	*R#209-* *R#140*	*R#210-* *R#140*	R#140- R#140
4		#141	Var2,Var4, Var6,Var7	*R#176-* *R#141*	*R#141-* *R#141*	*R#201-* *R#141*	*R#141-* *R#141*	*R#208-* *R#141*	*R#141-* *R#141*	*R#141-* *R#141*	R#211- R#141
4		#142	Var2,Var4, Var6,Var8	*R#177-* *R#142*	*R#142-* *R#142*	*R#202-* *R#142*	*R#142-* *R#142*	*R#209-* *R#142*	*R#142-* *R#142*	*R#211-* *R#142*	R#142- R#142
4		#143	Var2,Var4, Var7,Var8	*R#178-* *R#143*	*R#143-* *R#143*	*R#203-* *R#143*	*R#143-* *R#143*	*R#210-* *R#143*	*R#211-* *R#143*	*R#143-* *R#143*	R#143- R#143

4		#144	Var2,Var5, Var6,Var7	*R#179-* *R#144*	*R#144-* *R#144*	*R#204-* *R#144*	*R#208-* *R#144*	*R#144-* *R#144*	*R#144-* *R#144*	*R#144-* *R#144*	R#212- R#144
4		#145	Var2,Var5, Var6,Var8	*R#180-* *R#145*	*R#145-* *R#145*	*R#205-* *R#145*	*R#209-* *R#145*	*R#145-* *R#145*	*R#145-* *R#145*	*R#212-* *R#145*	R#145- R#145
4		#146	Var2,Var5, Var7,Var8	*R#181-* *R#146*	*R#146-* *R#146*	*R#206-* *R#146*	*R#210-* *R#146*	*R#146-* *R#146*	*R#212-* *R#146*	*R#146-* *R#146*	R#146- R#146
4		#147	Var2,Var6, Var7,Var8	*R#182-* *R#147*	*R#147-* *R#147*	*R#207-* *R#147*	*R#211-* *R#147*	*R#212-* *R#147*	*R#147-* *R#147*	*R#147-* *R#147*	R#147- R#147
4		#148	Var3,Var4, Var5,Var6	*R#183-* *R#148*	*R#198-* *R#148*	*R#148-* *R#148*	*R#148-* *R#148*	*R#148-* *R#148*	*R#148-* *R#148*	*R#213-* *R#148*	R#214- R#148
4		#149	Var3,Var4, Var5,Var7	*R#184-* *R#149*	*R#199-* *R#149*	*R#149-* *R#149*	*R#149-* *R#149*	*R#149-* *R#149*	*R#213-* *R#149*	*R#149-* *R#149*	R#215- R#149
4		#150	Var3,Var4, Var5,Var8	*R#185-* *R#150*	*R#200-* *R#150*	*R#150-* *R#150*	*R#150-* *R#150*	*R#150-* *R#150*	*R#214-* *R#150*	*R#215-* *R#150*	R#150- R#150
4		#151	Var3,Var4, Var6,Var7	*R#186-* *R#151*	*R#201-* *R#151*	*R#151-* *R#151*	*R#151-* *R#151*	*R#213-* *R#151*	*R#151-* *R#151*	*R#151-* *R#151*	R#216- R#151
4		#152	Var3,Var4, Var6,Var8	*R#187-* *R#152*	*R#202-* *R#152*	*R#152-* *R#152*	*R#152-* *R#152*	*R#214-* *R#152*	*R#152-* *R#152*	*R#216-* *R#152*	R#152- R#152
4		#153	Var3,Var4, Var7,Var8	*R#188-* *R#153*	*R#203-* *R#153*	*R#153-* *R#153*	*R#153-* *R#153*	*R#215-* *R#153*	*R#216-* *R#153*	*R#153-* *R#153*	R#153- R#153
4		#154	Var3,Var5, Var6,Var7	*R#189-* *R#154*	*R#204-* *R#154*	*R#154-* *R#154*	*R#213-* *R#154*	*R#154-* *R#154*	*R#154-* *R#154*	*R#154-* *R#154*	R#217- R#154
4		#155	Var3,Var5, Var6,Var8	*R#190-* *R#155*	*R#205-* *R#155*	*R#155-* *R#155*	*R#214-* *R#155*	*R#155-* *R#155*	*R#155-* *R#155*	*R#217-* *R#155*	R#155- R#155
4		#156	Var3,Var5, Var7,Var8	*R#191-* *R#156*	*R#206-* *R#156*	*R#156-* *R#156*	*R#215-* *R#156*	*R#156-* *R#156*	*R#217-* *R#156*	*R#156-* *R#156*	R#156- R#156
4		#157	Var3,Var6, Var7,Var8	*R#192-* *R#157*	*R#207-* *R#157*	*R#157-* *R#157*	*R#216-* *R#157*	*R#217-* *R#157*	*R#157-* *R#157*	*R#157-* *R#157*	R#157- R#157
4		#158	Var4,Var5, Var6,Var7	*R#193-* *R#158*	*R#208-* *R#158*	*R#213-* *R#158*	*R#158-* *R#158*	*R#158-* *R#158*	*R#158-* *R#158*	*R#158-* *R#158*	R#218- R#158
4		#159	Var4,Var5, Var6,Var8	*R#194-* *R#159*	*R#209-* *R#159*	*R#214-* *R#159*	*R#159-* *R#159*	*R#159-* *R#159*	*R#159-* *R#159*	*R#218-* *R#159*	R#159- R#159

4		#160	Var4,Var5, Var7,Var8	*R#195-R#160*	*R#210-R#160*	*R#215-R#160*	*R#160-R#160*	*R#160-R#160*	*R#218-R#160*	*R#160-R#160*	R#160-R#160
4		#161	Var4,Var6, Var7,Var8	*R#196-R#161*	*R#211-R#161*	*R#216-R#161*	*R#161-R#161*	*R#218-R#161*	*R#161-R#161*	*R#161-R#161*	R#161-R#161
4		#162	Var5,Var6, Var7,Var8	*R#197-R#162*	*R#212-R#162*	*R#217-R#162*	*R#218-R#162*	*R#162-R#162*	*R#162-R#162*	*R#162-R#162*	R#162-R#162
4	*70*			*i=1 k=4 average = M14*	*i=2 k=4 average = M24*	*i=3 k=4 average = M34*	*i=4 k=4 average = M44*	*i=5 k=4 average = M54*	*i=6 k=4 average = M64*	*i=7 k=4 average = M74*	*i=8 k=4 average = M84*
5		#163	Var1,Var2, Var3,Var4, Var5	*R#163-R#163*	*R#163-R#163*	*R#163-R#163*	*R#163-R#163*	*R#163-R#163*	*R#219-R#163*	*R#220-R#163*	R#221-R#163
5		#164	Var1,Var2, Var3,Var4, Var6	*R#164-R#164*	*R#164-R#164*	*R#164-R#164*	*R#164-R#164*	*R#219-R#164*	*R#164-R#164*	*R#222-R#164*	R#223-R#164
5		#165	Var1,Var2, Var3,Var4, Var7	*R#165-R#165*	*R#165-R#165*	*R#165-R#165*	*R#165-R#165*	*R#220-R#165*	*R#222-R#165*	*R#165-R#165*	R#224-R#165
5		#166	Var1,Var2, Var3,Var4, Var8	*R#166-R#166*	*R#166-R#166*	*R#166-R#166*	*R#166-R#166*	*R#221-R#166*	*R#223-R#166*	*R#224-R#166*	R#166-R#166
5		#167	Var1,Var2, Var3,Var5, Var6	*R#167-R#167*	*R#167-R#167*	*R#167-R#167*	*R#219-R#167*	*R#167-R#167*	*R#167-R#167*	*R#225-R#167*	R#226-R#167
5		#168	Var1,Var2, Var3,Var5, Var7	*R#168-R#168*	*R#168-R#168*	*R#168-R#168*	*R#220-R#168*	*R#168-R#168*	*R#225-R#168*	*R#168-R#168*	R#227-R#168
5		#169	Var1,Var2, Var3,Var5, Var8	*R#169-R#169*	*R#169-R#169*	*R#169-R#169*	*R#221-R#169*	*R#169-R#169*	*R#226-R#169*	*R#227-R#169*	R#169-R#169
5		#170	Var1,Var2, Var3,Var6, Var7	*R#170-R#170*	*R#170-R#170*	*R#170-R#170*	*R#222-R#170*	*R#225-R#170*	*R#170-R#170*	*R#170-R#170*	R#228-R#170

5		#171	Var1,Var2, Var3,Var6, Var8	*R#171-* *R#171*	*R#171-* *R#171*	*R#171-* *R#171*	*R#223-* *R#171*	*R#226-* *R#171*	*R#171-* *R#171*	*R#228-* *R#171*	R#171- R#171
5		#172	Var1,Var2, Var3,Var7, Var8	*R#172-* *R#172*	*R#172-* *R#172*	*R#172-* *R#172*	*R#224-* *R#172*	*R#227-* *R#172*	*R#228-* *R#172*	*R#172-* *R#172*	R#172- R#172
5		#173	Var1,Var2, Var4,Var5, Var6	*R#173-* *R#173*	*R#173-* *R#173*	*R#219-* *R#173*	*R#173-* *R#173*	*R#173-* *R#173*	*R#173-* *R#173*	*R#229-* *R#173*	R#230- R#173
5		#174	Var1,Var2, Var4,Var5, Var7	*R#174-* *R#174*	*R#174-* *R#174*	*R#220-* *R#174*	*R#174-* *R#174*	*R#174-* *R#174*	*R#229-* *R#174*	*R#174-* *R#174*	R#231- R#174
5		#175	Var1,Var2, Var4,Var5, Var8	*R#175-* *R#175*	*R#175-* *R#175*	*R#221-* *R#175*	*R#175-* *R#175*	*R#175-* *R#175*	*R#230-* *R#175*	*R#231-* *R#175*	R#175- R#175
5		#176	Var1,Var2, Var4,Var6, Var7	*R#176-* *R#176*	*R#176-* *R#176*	*R#222-* *R#176*	*R#176-* *R#176*	*R#229-* *R#176*	*R#176-* *R#176*	*R#176-* *R#176*	R#232- R#176
5		#177	Var1,Var2, Var4,Var6, Var8	*R#177-* *R#177*	*R#177-* *R#177*	*R#223-* *R#177*	*R#177-* *R#177*	*R#230-* *R#177*	*R#177-* *R#177*	*R#232-* *R#177*	R#177- R#177
5		#178	Var1,Var2, Var4,Var7, Var8	*R#178-* *R#178*	*R#178-* *R#178*	*R#224-* *R#178*	*R#178-* *R#178*	*R#231-* *R#178*	*R#232-* *R#178*	*R#178-* *R#178*	R#178- R#178
5		#179	Var1,Var2, Var5,Var6, Var7	*R#179-* *R#179*	*R#179-* *R#179*	*R#225-* *R#179*	*R#229-* *R#179*	*R#179-* *R#179*	*R#179-* *R#179*	*R#179-* *R#179*	R#233- R#179
5		#180	Var1,Var2, Var5,Var6, Var8	*R#180-* *R#180*	*R#180-* *R#180*	*R#226-* *R#180*	*R#230-* *R#180*	*R#180-* *R#180*	*R#180-* *R#180*	*R#233-* *R#180*	R#180- R#180
5		#181	Var1,Var2, Var5,Var7, Var8	*R#181-* *R#181*	*R#181-* *R#181*	*R#227-* *R#181*	*R#231-* *R#181*	*R#181-* *R#181*	*R#233-* *R#181*	*R#181-* *R#181*	R#181- R#181

5		#182	Var1,Var2, Var6,Var7, Var8	*R#182-* *R#182*	*R#182-* *R#182*	*R#228-* *R#182*	*R#232-* *R#182*	*R#233-* *R#182*	*R#182-* *R#182*	*R#182-* *R#182*	R#182- R#182
5		#183	Var1,Var3, Var4,Var5, Var6	*R#183-* *R#183*	*R#219-* *R#183*	*R#183-* *R#183*	*R#183-* *R#183*	*R#183-* *R#183*	*R#183-* *R#183*	*R#234-* *R#183*	R#235- R#183
5		#184	Var1,Var3, Var4,Var5, Var7	*R#184-* *R#184*	*R#220-* *R#184*	*R#184-* *R#184*	*R#184-* *R#184*	*R#184-* *R#184*	*R#234-* *R#184*	*R#184-* *R#184*	R#236- R#184
5		#185	Var1,Var3, Var4,Var5, Var8	*R#185-* *R#185*	*R#221-* *R#185*	*R#185-* *R#185*	*R#185-* *R#185*	*R#185-* *R#185*	*R#235-* *R#185*	*R#236-* *R#185*	R#185- R#185
5		#186	Var1,Var3, Var4,Var6, Var7	*R#186-* *R#186*	*R#222-* *R#186*	*R#186-* *R#186*	*R#186-* *R#186*	*R#234-* *R#186*	*R#186-* *R#186*	*R#186-* *R#186*	R#237- R#186
5		#187	Var1,Var3, Var4,Var6, Var8	*R#187-* *R#187*	*R#223-* *R#187*	*R#187-* *R#187*	*R#187-* *R#187*	*R#235-* *R#187*	*R#187-* *R#187*	*R#237-* *R#187*	R#187- R#187
5		#188	Var1,Var3, Var4,Var7, Var8	*R#188-* *R#188*	*R#224-* *R#188*	*R#188-* *R#188*	*R#188-* *R#188*	*R#236-* *R#188*	*R#237-* *R#188*	*R#188-* *R#188*	R#188- R#188
5		#189	Var1,Var3, Var5,Var6, Var7	*R#189-* *R#189*	*R#225-* *R#189*	*R#189-* *R#189*	*R#234-* *R#189*	*R#189-* *R#189*	*R#189-* *R#189*	*R#189-* *R#189*	R#238- R#189
5		#190	Var1,Var3, Var5,Var6, Var8	*R#190-* *R#190*	*R#226-* *R#190*	*R#190-* *R#190*	*R#235-* *R#190*	*R#190-* *R#190*	*R#190-* *R#190*	*R#238-* *R#190*	R#190- R#190
5		#191	Var1,Var3, Var5,Var7, Var8	*R#191-* *R#191*	*R#227-* *R#191*	*R#191-* *R#191*	*R#236-* *R#191*	*R#191-* *R#191*	*R#238-* *R#191*	*R#191-* *R#191*	R#191- R#191
5		#192	Var1,Var3, Var6,Var7, Var8	*R#192-* *R#192*	*R#228-* *R#192*	*R#192-* *R#192*	*R#237-* *R#192*	*R#238-* *R#192*	*R#192-* *R#192*	*R#192-* *R#192*	R#192- R#192

5		#193	Var1,Var4, Var5,Var6, Var7	*R#193*-*R#193*	*R#229*-*R#193*	*R#234*-*R#193*	*R#193*-*R#193*	*R#193*-*R#193*	*R#193*-*R#193*	*R#193*-*R#193*	R#239-R#193
5		#194	Var1,Var4, Var5,Var6, Var8	*R#194*-*R#194*	*R#230*-*R#194*	*R#235*-*R#194*	*R#194*-*R#194*	*R#194*-*R#194*	*R#194*-*R#194*	*R#239*-*R#194*	R#194-R#194
5		#195	Var1,Var4, Var5,Var7, Var8	*R#195*-*R#195*	*R#231*-*R#195*	*R#236*-*R#195*	*R#195*-*R#195*	*R#195*-*R#195*	*R#239*-*R#195*	*R#195*-*R#195*	R#195-R#195
5		#196	Var1,Var4, Var6,Var7, Var8	*R#196*-*R#196*	*R#232*-*R#196*	*R#237*-*R#196*	*R#196*-*R#196*	*R#239*-*R#196*	*R#196*-*R#196*	*R#196*-*R#196*	R#196-R#196
5		#197	Var1,Var5, Var6,Var7, Var8	*R#197*-*R#197*	*R#233*-*R#197*	*R#238*-*R#197*	*R#239*-*R#197*	*R#197*-*R#197*	*R#197*-*R#197*	*R#197*-*R#197*	R#197-R#197
5		#198	Var2,Var3, Var4,Var5, Var6	*R#219*-*R#198*	*R#198*-*R#198*	*R#198*-*R#198*	*R#198*-*R#198*	*R#198*-*R#198*	*R#198*-*R#198*	*R#240*-*R#198*	R#241-R#198
5		#199	Var2,Var3, Var4,Var5, Var7	*R#220*-*R#199*	*R#199*-*R#199*	*R#199*-*R#199*	*R#199*-*R#199*	*R#199*-*R#199*	*R#240*-*R#199*	*R#199*-*R#199*	R#242-R#199
5		#200	Var2,Var3, Var4,Var5, Var8	*R#221*-*R#200*	*R#200*-*R#200*	*R#200*-*R#200*	*R#200*-*R#200*	*R#200*-*R#200*	*R#241*-*R#200*	*R#242*-*R#200*	R#200-R#200
5		#201	Var2,Var3, Var4,Var6, Var7	*R#222*-*R#201*	*R#201*-*R#201*	*R#201*-*R#201*	*R#201*-*R#201*	*R#240*-*R#201*	*R#201*-*R#201*	*R#201*-*R#201*	R#243-R#201
5		#202	Var2,Var3, Var4,Var6, Var8	*R#223*-*R#202*	*R#202*-*R#202*	*R#202*-*R#202*	*R#202*-*R#202*	*R#241*-*R#202*	*R#202*-*R#202*	*R#243*-*R#202*	R#202-R#202
5		#203	Var2,Var3, Var4,Var7, Var8	*R#224*-*R#203*	*R#203*-*R#203*	*R#203*-*R#203*	*R#203*-*R#203*	*R#242*-*R#203*	*R#243*-*R#203*	*R#203*-*R#203*	R#203-R#203

5		#204	Var2,Var3, Var5,Var6, Var7	*R#225-R#204*	*R#204-R#204*	*R#204-R#204*	*R#240-R#204*	*R#204-R#204*	*R#204-R#204*	*R#204-R#204*	R#244-R#204
5		#205	Var2,Var3, Var5,Var6, Var8	*R#226-R#205*	*R#205-R#205*	*R#205-R#205*	*R#241-R#205*	*R#205-R#205*	*R#205-R#205*	*R#244-R#205*	R#205-R#205
5		#206	Var2,Var3, Var5,Var7, Var8	*R#227-R#206*	*R#206-R#206*	*R#206-R#206*	*R#242-R#206*	*R#206-R#206*	*R#244-R#206*	*R#206-R#206*	R#206-R#206
5		#207	Var2,Var3, Var6,Var7, Var8	*R#228-R#207*	*R#207-R#207*	*R#207-R#207*	*R#243-R#207*	*R#244-R#207*	*R#207-R#207*	*R#207-R#207*	R#207-R#207
5		#208	Var2,Var4, Var5,Var6, Var7	*R#229-R#208*	*R#208-R#208*	*R#240-R#208*	*R#208-R#208*	*R#208-R#208*	*R#208-R#208*	*R#208-R#208*	R#245-R#208
5		#209	Var2,Var4, Var5,Var6, Var8	*R#230-R#209*	*R#209-R#209*	*R#241-R#209*	*R#209-R#209*	*R#209-R#209*	*R#209-R#209*	*R#245-R#209*	R#209-R#209
5		#210	Var2,Var4, Var5,Var7, Var8	*R#231-R#210*	*R#210-R#210*	*R#242-R#210*	*R#210-R#210*	*R#210-R#210*	*R#245-R#210*	*R#210-R#210*	R#210-R#210
5		#211	Var2,Var4, Var6,Var7, Var8	*R#232-R#211*	*R#211-R#211*	*R#243-R#211*	*R#211-R#211*	*R#245-R#211*	*R#211-R#211*	*R#211-R#211*	R#211-R#211
5		#212	Var2,Var5, Var6,Var7, Var8	*R#233-R#212*	*R#212-R#212*	*R#244-R#212*	*R#245-R#212*	*R#212-R#212*	*R#212-R#212*	*R#212-R#212*	R#212-R#212
5		#213	Var3,Var4, Var5,Var6, Var7	*R#234-R#213*	*R#240-R#213*	*R#213-R#213*	*R#213-R#213*	*R#213-R#213*	*R#213-R#213*	*R#213-R#213*	R#246-R#213
5		#214	Var3,Var4, Var5,Var6, Var8	*R#235-R#214*	*R#241-R#214*	*R#214-R#214*	*R#214-R#214*	*R#214-R#214*	*R#214-R#214*	*R#246-R#214*	R#214-R#214

5		#215	Var3,Var4, Var5,Var7, Var8	*R#236-R#215*	*R#242-R#215*	*R#215-R#215*	*R#215-R#215*	*R#215-R#215*	*R#246-R#215*	*R#215-R#215*	R#215-R#215
5		#216	Var3,Var4, Var6,Var7, Var8	*R#237-R#216*	*R#243-R#216*	*R#216-R#216*	*R#216-R#216*	*R#246-R#216*	*R#216-R#216*	*R#216-R#216*	R#216-R#216
5		#217	Var3,Var5, Var6,Var7, Var8	*R#238-R#217*	*R#244-R#217*	*R#217-R#217*	*R#246-R#217*	*R#217-R#217*	*R#217-R#217*	*R#217-R#217*	R#217-R#217
5		#218	Var4,Var5, Var6,Var7, Var8	*R#239-R#218*	*R#245-R#218*	*R#246-R#218*	*R#218-R#218*	*R#218-R#218*	*R#218-R#218*	*R#218-R#218*	R#218-R#218
5	*56*			*i=1 k=5 average = M15*	*i=2 k=5 average = M25*	*i=3 k=5 average = M35*	*i=4 k=5 average = M45*	*i=5 k=5 average = M55*	*i=6 k=5 average = M65*	*i=7 k=5 average = M75*	*i=8 k=5 average = M85*
6		#219	Var1,Var2, Var3,Var4, Var5,Var6	*R#219-R#219*	*R#219-R#219*	*R#219-R#219*	*R#219-R#219*	*R#219-R#219*	*R#219-R#219*	*R#247-R#219*	R#248-R#219
6		#220	Var1,Var2, Var3,Var4, Var5,Var7	*R#220-R#220*	*R#220-R#220*	*R#220-R#220*	*R#220-R#220*	*R#220-R#220*	*R#247-R#220*	*R#220-R#220*	R#249-R#220
6		#221	Var1,Var2, Var3,Var4, Var5,Var8	*R#221-R#221*	*R#221-R#221*	*R#221-R#221*	*R#221-R#221*	*R#221-R#221*	*R#248-R#221*	*R#249-R#221*	R#221-R#221
6		#222	Var1,Var2, Var3,Var4, Var6,Var7	*R#222-R#222*	*R#222-R#222*	*R#222-R#222*	*R#222-R#222*	*R#247-R#222*	*R#222-R#222*	*R#222-R#222*	R#250-R#222
6		#223	Var1,Var2, Var3,Var4, Var6,Var8	*R#223-R#223*	*R#223-R#223*	*R#223-R#223*	*R#223-R#223*	*R#248-R#223*	*R#223-R#223*	*R#250-R#223*	R#223-R#223
6		#224	Var1,Var2, Var3,Var4, Var7,Var8	*R#224-R#224*	*R#224-R#224*	*R#224-R#224*	*R#224-R#224*	*R#249-R#224*	*R#250-R#224*	*R#224-R#224*	R#224-R#224

6		#225	Var1,Var2, Var3,Var5, Var6,Var7	*R#225-R#225*	*R#225-R#225*	*R#225-R#225*	*R#247-R#225*	*R#225-R#225*	*R#225-R#225*	*R#225-R#225*	R#251-R#225
6		#226	Var1,Var2, Var3,Var5, Var6,Var8	*R#226-R#226*	*R#226-R#226*	*R#226-R#226*	*R#248-R#226*	*R#226-R#226*	*R#226-R#226*	*R#251-R#226*	R#226-R#226
6		#227	Var1,Var2, Var3,Var5, Var7,Var8	*R#227-R#227*	*R#227-R#227*	*R#227-R#227*	*R#249-R#227*	*R#227-R#227*	*R#251-R#227*	*R#227-R#227*	R#227-R#227
6		#228	Var1,Var2, Var3,Var6, Var7,Var8	*R#228-R#228*	*R#228-R#228*	*R#228-R#228*	*R#250-R#228*	*R#251-R#228*	*R#228-R#228*	*R#228-R#228*	R#228-R#228
6		#229	Var1,Var2, Var4,Var5, Var6,Var7	*R#229-R#229*	*R#229-R#229*	*R#247-R#229*	*R#229-R#229*	*R#229-R#229*	*R#229-R#229*	*R#229-R#229*	R#252-R#229
6		#230	Var1,Var2, Var4,Var5, Var6,Var8	*R#230-R#230*	*R#230-R#230*	*R#248-R#230*	*R#230-R#230*	*R#230-R#230*	*R#230-R#230*	*R#252-R#230*	R#230-R#230
6		#231	Var1,Var2, Var4,Var5, Var7,Var8	*R#231-R#231*	*R#231-R#231*	*R#249-R#231*	*R#231-R#231*	*R#231-R#231*	*R#252-R#231*	*R#231-R#231*	R#231-R#231
6		#232	Var1,Var2, Var4,Var6, Var7,Var8	*R#232-R#232*	*R#232-R#232*	*R#250-R#232*	*R#232-R#232*	*R#252-R#232*	*R#232-R#232*	*R#232-R#232*	R#232-R#232
6		#233	Var1,Var2, Var5,Var6, Var7,Var8	*R#233-R#233*	*R#233-R#233*	*R#251-R#233*	*R#252-R#233*	*R#233-R#233*	*R#233-R#233*	*R#233-R#233*	R#233-R#233
6		#234	Var1,Var3, Var4,Var5, Var6,Var7	*R#234-R#234*	*R#247-R#234*	*R#234-R#234*	*R#234-R#234*	*R#234-R#234*	*R#234-R#234*	*R#234-R#234*	R#253-R#234
6		#235	Var1,Var3, Var4,Var5, Var6,Var8	*R#235-R#235*	*R#248-R#235*	*R#235-R#235*	*R#235-R#235*	*R#235-R#235*	*R#235-R#235*	*R#253-R#235*	R#235-R#235

6		#236	Var1,Var3, Var4,Var5, Var7,Var8	*R#236-* *R#236*	*R#249-* *R#236*	*R#236-* *R#236*	*R#236-* *R#236*	*R#236-* *R#236*	*R#253-* *R#236*	*R#236-* *R#236*	R#236- R#236
6		#237	Var1,Var3, Var4,Var6, Var7,Var8	*R#237-* *R#237*	*R#250-* *R#237*	*R#237-* *R#237*	*R#237-* *R#237*	*R#253-* *R#237*	*R#237-* *R#237*	*R#237-* *R#237*	R#237- R#237
6		#238	Var1,Var3, Var5,Var6, Var7,Var8	*R#238-* *R#238*	*R#251-* *R#238*	*R#238-* *R#238*	*R#253-* *R#238*	*R#238-* *R#238*	*R#238-* *R#238*	*R#238-* *R#238*	R#238- R#238
6		#239	Var1,Var4, Var5,Var6, Var7,Var8	*R#239-* *R#239*	*R#252-* *R#239*	*R#253-* *R#239*	*R#239-* *R#239*	*R#239-* *R#239*	*R#239-* *R#239*	*R#239-* *R#239*	R#239- R#239
6		#240	Var2,Var3, Var4,Var5, Var6,Var7	*R#247-* *R#240*	*R#240-* *R#240*	*R#240-* *R#240*	*R#240-* *R#240*	*R#240-* *R#240*	*R#240-* *R#240*	*R#240-* *R#240*	R#254- R#240
6		#241	Var2,Var3, Var4,Var5, Var6,Var8	*R#248-* *R#241*	*R#241-* *R#241*	*R#241-* *R#241*	*R#241-* *R#241*	*R#241-* *R#241*	*R#241-* *R#241*	*R#254-* *R#241*	R#241- R#241
6		#242	Var2,Var3, Var4,Var5, Var7,Var8	*R#249-* *R#242*	*R#242-* *R#242*	*R#242-* *R#242*	*R#242-* *R#242*	*R#242-* *R#242*	*R#254-* *R#242*	*R#242-* *R#242*	R#242- R#242
6		#243	Var2,Var3, Var4,Var6, Var7,Var8	*R#250-* *R#243*	*R#243-* *R#243*	*R#243-* *R#243*	*R#243-* *R#243*	*R#254-* *R#243*	*R#243-* *R#243*	*R#243-* *R#243*	R#243- R#243
6		#244	Var2,Var3, Var5,Var6, Var7,Var8	*R#251-* *R#244*	*R#244-* *R#244*	*R#244-* *R#244*	*R#254-* *R#244*	*R#244-* *R#244*	*R#244-* *R#244*	*R#244-* *R#244*	R#244- R#244
6		#245	Var2,Var4, Var5,Var6, Var7,Var8	*R#252-* *R#245*	*R#245-* *R#245*	*R#254-* *R#245*	*R#245-* *R#245*	*R#245-* *R#245*	*R#245-* *R#245*	*R#245-* *R#245*	R#245- R#245
6		#246	Var3,Var4, Var5,Var6, Var7,Var8	*R#253-* *R#246*	*R#254-* *R#246*	*R#246-* *R#246*	*R#246-* *R#246*	*R#246-* *R#246*	*R#246-* *R#246*	*R#246-* *R#246*	R#246- R#246

6	*28*			*i=1 k=6 average = M16*	*i=2 k=6 average = M26*	*i=3 k=6 average = M36*	*i=4 k=6 average = M46*	*i=5 k=6 average = M56*	*i=6 k=6 average = M66*	*i=7 k=6 average = M76*	*i=8 k=6 average = M86*
7		#247	Var1,Var2, Var3,Var4, Var5,Var6, Var7	*R#247-R#247*	*R#247-R#247*	*R#247-R#247*	*R#247-R#247*	*R#247-R#247*	*R#247-R#247*	*R#247-R#247*	R#255-R#247
7		#248	Var1,Var2, Var3,Var4, Var5,Var6, Var8	*R#248-R#248*	*R#248-R#248*	*R#248-R#248*	*R#248-R#248*	*R#248-R#248*	*R#248-R#248*	*R#255-R#248*	R#248-R#248
7		#249	Var1,Var2, Var3,Var4, Var5,Var7, Var8	*R#249-R#249*	*R#249-R#249*	*R#249-R#249*	*R#249-R#249*	*R#249-R#249*	*R#255-R#249*	*R#249-R#249*	R#249-R#249
7		#250	Var1,Var2, Var3,Var4, Var6,Var7, Var8	*R#250-R#250*	*R#250-R#250*	*R#250-R#250*	*R#250-R#250*	*R#255-R#250*	*R#250-R#250*	*R#250-R#250*	R#250-R#250
7		#251	Var1,Var2, Var3,Var5, Var6,Var7, Var8	*R#251-R#251*	*R#251-R#251*	*R#251-R#251*	*R#255-R#251*	*R#251-R#251*	*R#251-R#251*	*R#251-R#251*	R#251-R#251
7		#252	Var1,Var2, Var4,Var5, Var6,Var7, Var8	*R#252-R#252*	*R#252-R#252*	*R#255-R#252*	*R#252-R#252*	*R#252-R#252*	*R#252-R#252*	*R#252-R#252*	R#252-R#252
7		#253	Var1,Var3, Var4,Var5, Var6,Var7, Var8	*R#253-R#253*	*R#255-R#253*	*R#253-R#253*	*R#253-R#253*	*R#253-R#253*	*R#253-R#253*	*R#253-R#253*	R#253-R#253
7		#254	Var2,Var3, Var4,Var5, Var6,Var7,	*R#255-R#254*	*R#254-R#254*	*R#254-R#254*	*R#254-R#254*	*R#254-R#254*	*R#254-R#254*	*R#254-R#254*	R#254-R#254

			Var8								
7	*8*			*i=1 k=7 average = M17*	*i=2 k=7 average = M27*	*i=3 k=7 average = M37*	*i=4 k=7 average = M47*	*i=5 k=7 average = M57*	*i=6 k=7 average = M67*	*i=7 k=7 average = M77*	*i=8 k=7 average = M87*
8		#255	Var1,Var2, Var3,Var4, Var5,Var6, Var7,Var8	*R#255-R#255*	*R#255-R#255*	*R#255-R#255*	*R#255-R#255*	*R#255-R#255*	*R#255-R#255*	*R#255-R#255*	R#255-R#255
8	*1*										
				D1= ∑M1k/8	*D2= ∑M2k/8*	*D3= ∑M3k/8*	*D4= ∑M4k/8*	*D5= ∑M5k/8*	*D6= ∑M6k/8*	*D7= ∑M7k/8*	*D8= ∑M8k/8*

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